DATE: May 11, 2006

TO: Doug Howard, Regional Administrator – Twin Falls

FROM: Olga Cuzmanov, Associate Engineer, Twin Falls Regional Office

SUBJECT: Seneca Foods Inc. – Wastewater Land Application Permit No. LA-000016-03

1.0 PURPOSE

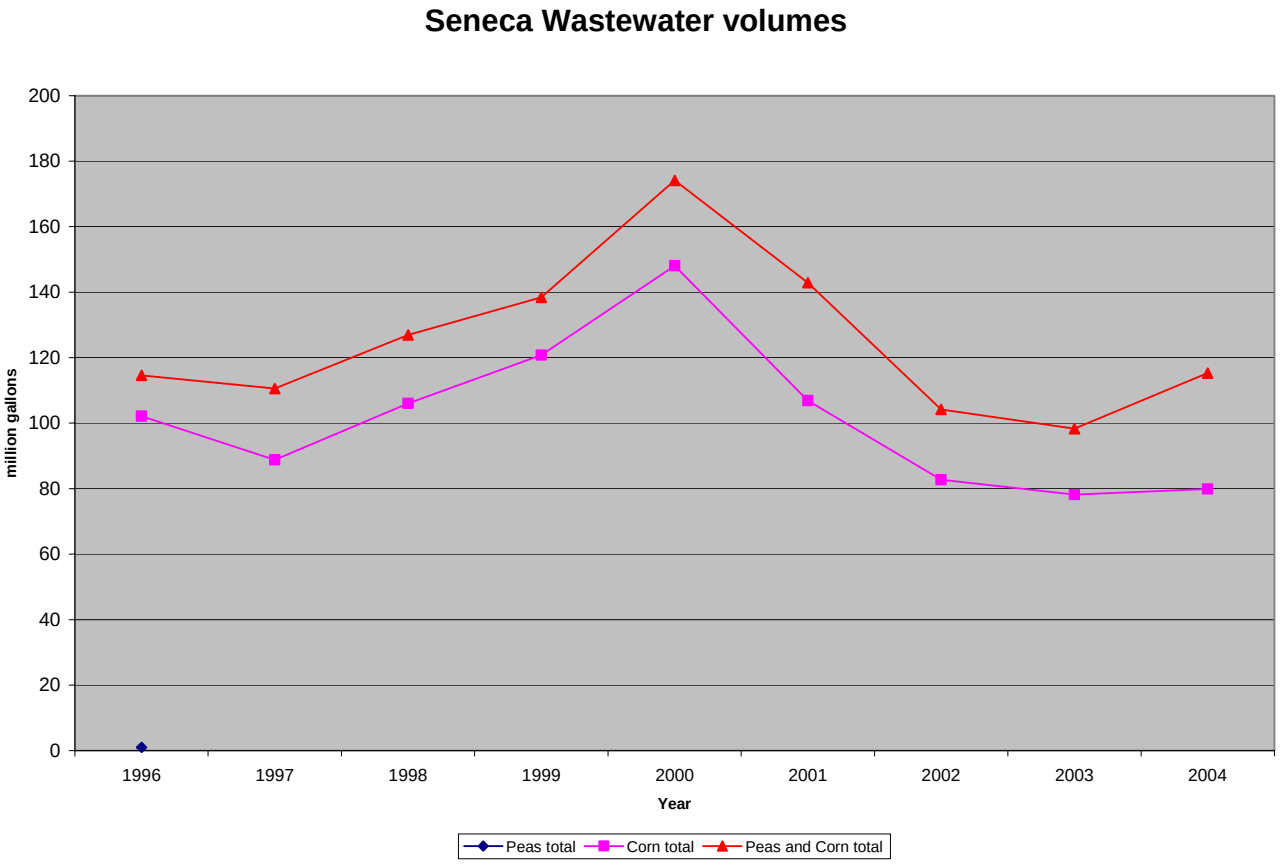
The purpose of this memorandum is to satisfy the requirements of IDAPA 16.01.17.400.07 for issuing wastewater land application permits.

2.0 PROCESS DESCRIPTION

Seneca Foods Inc. purchased this facility from the Pillsbury Company prior to the 1995 operating season. The facility, which processes peas and corn, is located east of Buhl, Idaho, and north of Highway 30.

Between 1996 and 2004, Seneca applied 100 to 174 million gallons per year of wastewater to 868 acres of farm land planted in barley, sweet corn, pinto beans, peas, triticale, alfalfa, oats and winter wheat. The current permit incorporates 696 acres of farm land permitted in 1995 and 172 acres permitted in 2002 and re-permitted in 2003 (MU-001607) or Miller site consisting of 72 acres and (MU-001608) or McDonald/Lemoyne site consisting of 100 acres. On September 15, 2005 DEQ permitted an additional 193 acres through a permit modification (MU-001609 or Paulson site consisting of 75 acres and MU-001610 or Gomez site consisting of 118 acres). Currently, the total permitted acreage for the land application site is 1061 acres.

Pea processing operations typically occur between May and July, which are followed by corn processing through October. The corn processing operations typically last 50 to 70 days. Starting summer of 2006 Seneca plans to process carrots up to a week every year. Between 1996 and 2004 an average of 24% of the wastewater volume originates from peas operations with the reminder coming from corn processing. Figure 6, in Attachment 1 shows a diagram of the wastewater pretreatment system.



The corn processing wastewater contains the heaviest concentrations of TDS, COD, and nutrients. On a mass basis, the corn processing wastewater has accounted for 90% of the inorganic TDS, 97% of the COD and 94% of the nitrogen. See Table 3 in Section 4.3, Wastewater Quality.

3.0 SUMMARY OF EVENTS

DEQ received Pillsbury's original permit application on September 29, 1988 and issued wastewater land application permit LA-000016 February 28, 1989 with an expiration date of January 31, 1994. On July 21, 1993, DEQ extended the permit expiration date to January 31, 1995.

Pillsbury applied to renew their permit in July 1994. Seneca Foods purchased the facility in 1995 and continued the permit renewal process. In March 1995, Seneca requested that an additional 224 acres of farmland be added to the land application system.

DEQ issued a draft permit for 696 acres of farming ground on April 12, 1995. Additional discussions were held with Seneca and their consultants, CH2MHill, and a site visit was conducted on May 19, 1995 to assist in completing the permit development. A second draft permit was issued June 16, 1995 and the second permit was issued on July 26, 1995 and expired on July 31, 2000.

Seneca submitted a WLAP permit renewal application on January 25, 2000. On June 11, 2001 a draft WLAP and staff analysis was transmitted for review and comment to Seneca Foods Inc. On September 11, 2001 DEQ received comments on Draft Wastewater Land Application Permit LA-000016-03 prepared by Cascade Earth Sciences (CES). A response to the comments was prepared by Gary Burkett, P.E. (EHM Engineers Inc.) in a memorandum to Dave Anderson dated October 30, 2001. Seneca's comments are further addressed throughout this staff analysis.

On June 17, 2002 a letter from Seneca Foods consultant (George Spinner, Managing Scientist with CES) discussed the addition of 72 acres (referred to as Miller Site) and a 100 acre parcel (referred to as McDonald/Lemoyne site). The proposal requested approval of the additional 172 acres at deminimis loading for the remainder of 2002 growing season. On August 16, 2002, the DEQ issued a modification to the permit authorizing the use of the new proposed sites through October 31, 2002. The following year, on July 11, 2003 a new permit modification for the same 172 acres was issued. The last permit modification will be in effect until issuance of the new permit.

An addendum to the permit renewal application prepared by George Spinner (CES) was received on November 12, 2002. The addendum requested that an additional 75 acres farm (referred to as Paulson) be permitted for land application of wastewater. On June 1, 2005 the Department received a request for a permit modification to include Paulson farm (75 acres) and Gomez farm (118 acres). The permit modification for the additional 193 acres was issued on September 15, 2005.

3.1 Improvements

In the past three years, Seneca initiated and implemented several improvements. Following is a list of the improvements:

- Addition of land application area consisting of 172 acres (72 acres Miller farm and 100 acres McDonald/LeMoyne farms) and 193 acres (75 acres Paulson farm and 118 acres Gomez farm);
- Installation of two shaker screens and two double screens prior to the surge pond;
- Non-volatile dissolved solids reduction by sending boiler water blowdown and softener recharge water to the city of Buhl wastewater treatment plant;
- Corn baler water collection into a trailer tank/slurry spreader and injection of the slurry below the ground surface;
- Water conservation measures, such as cooker micro-valve and freezer coil defrost water recycling;
- Installation of four (4) new monitoring wells during the summer of 2003 to provide a more adequate groundwater monitoring network;
- Installation of three (3) new pivots covering approximately 201 acres (Pivot 1covering 61.5 acres of Love and HDS farms, Pivot 2 covering 49.3 acres of Pence farm and Pivot 3 covering 90.2 acres of Hendrix and Kaster farms).

3.2 Inspections

On September 11, 1996, Paul Wakagawa from the DEQ State Office inspected the site. Following are some of the comments incorporated with the inspection report (letter dated October 9, 1996) from Paul Wakagawa to Doug Thorson:

- For overall management of high strength wastewater (corn process water), Seneca has set limits on wastewater application volume for each Hydraulic management unit (HMU) based on historical wastewater quality and the maximum COD limit (265 lb/ac-day);
- Thus far in 1996, there has been one nitrate result above 10 mg/l for the Bussman downgradient well GW-1 8 (11 .0 mg/l);
- The Hatfield area received excess wastewater in 1996 due to a plugged pipeline in the wastewater distribution system;
- Close management of the irrigation systems is required to minimize tailwater and provide even distribution of wastewater. Seneca's land application treatment system appears to be well managed.
- Over time, the corn process wastewater develops a slimy, stringy solid which collects in the irrigation distribution system. These solids get caught up in the gates in the gated pipe and cause uneven flows. This requires close management of the system to ensure even distribution. Seneca is investigating possible solutions.
- "Earlier this year, by mistake, I (Paul Wakagawa) told Doug Thorson that for furrow irrigation, the land application guidelines specify a 100 feet buffer zone between land application sites and homes. The guidelines actually specify 300 feet. If justified, buffer zones of less than 300 feet may be appropriate. Because of the following characteristics of Seneca's land application system, buffer zones of 100 feet will be allowed:
    1. Furrow irrigation doesn't produce any aerosol drift;
    2. The majority of homes located near the site (along Burley Ave.)
    3. The capture zone analysis performed by CH2MHill for a typical domestic well in this area is 33 feet (Operation Plan for Land Application System, July 1994, document RME35238.AO);
    4. The wastewater does not contain domestic wastewater, and
    5. Seneca has an approved odor management plan outlining Best Management Practices (BMP's) that will be used to reduce/minimize odors which may result from activities associated with the land application systems.

On September 20, 2002 David Anderson and Olga Lautt from Twin Falls Regional DEQ office met with Seneca representatives and performed an inspection. Following are the comments based on the findings during the site review (letter dated February 25, 2003 from Olga Lautt to Russell Grubb):

- The growing season COD loading for the new permitted sites (August 16, 2002) was set at 50 lbs/ac-day. This limit was exceeded at MU-001607, the Miller site by 39% (calculated loading is 69 lb/ac-day). According to the comment received from Seneca (see letter from Russell Grubb to Olga Lautt dated February 13, 2003) "We (Seneca) do not feel that this is an acceptable working loading rate (50 lb/ac/day averaged for 184 days) for the new acreage under a new permit". The draft WLAP permit modification (allowing the addition of Miller and McDonald site) was made available for public comment between July 29, 2002 and August 12, 2002. Seneca did not submit comments and the permit modification was issued as drafted. The exceedance constitutes a violation of the permit, and may be referred for enforcement action.
- The Department of Environmental Quality (DEQ) is concerned with the drastic increase of the Nitrate and TDS in the Hatfield monitoring well between October 2001 and October 2002. According to the letter dated February 13, 2003 it is believed that Hatfield well may not be

representative of the land application activities, due to other factors that may impact the quality of the water collected from the well. The following was stated in the letter: "For that reason, Seneca Foods has approved a project to install additional monitoring wells in the new locations and at a deeper depth for the spring of 2003". Prior to installation of new or modification of existing ground water monitoring wells Seneca shall submit to DEQ for review and approval a formal Groundwater Monitoring Plan. An informal Ground Water Monitoring Wells Plan was sent via e-mail on 6/12/02 (from George Spinner to Olga Lautt) but did not contain all the information necessary for the review by DEQ.

- There is evidence of occasional hydraulic overloading (due to non-uniform distribution of the wastewater in the gated pipe irrigated fields) as indicated by the brown spots in the land application fields. The mode of wastewater land application, flooded irrigation through gated pipe does not appear to be well enough designed and managed to provide a uniform coverage of the fields. It is strongly recommended that a transition be made to a sprinkler irrigation system. Also, see the discussion of the Water Management and Irrigation Uniformity in the Application for Wastewater Land Application Permit, prepared by CH2MHill, for Seneca Foods Inc., January 2000, regarding the existing gated pipe furrow irrigation. According to the letter dated February 13, 2003 (from Russell Grubb to Olga Lautt) "Seneca is making changes within the processing facility for 2003 production to reduce the volume of process water and loading that is applied to the process water fields". A list of planned improvements is presented in the above-mentioned letter.
- DEQ strongly recommends that the permittee use an odor log and inform DEQ when the complaints are directed to the facility. DEQ will use the Odor Policy PM00-6 in responding to odor complaints. According to the letter dated February 13 2003 Seneca will "expand upon the file to maintain an odor log" and "respond to the complaint". See the above-mentioned letter for additional information of the odor complaint log and response.
- A McCrometer flowmeter is used for flow metering of the wastewater going into the surge pond prior to distribution to land application sites. The installation of the flowmeter is questionable as far as the upstream and downstream distances, as well as the angle at which the flowmeter is installed on the pipe. Seneca Foods needs to verify if the manufacturer's installation recommendations were followed and provide justification of the accuracy of the flowmeter. Also, no calibration of the flowmeter was performed since the installation in 1995. DEQ strongly recommends that the wastewater distributed to various fields is monitored (estimated) more accurate. According to the letter dated February 13, 2003 "the flowmeters have been removed and sent in for calibration. We are obtaining information and questioning the angle of the pipe and the upstream and downstream distances for the meter installation".

Seneca did address all the above items in the February 13, 2003 letter. Please see source files for details.

On September 7, 2004 David Anderson and Olga Lautt from Twin Falls Regional DEQ office met with Seneca representatives and performed an inspection. Following are the comments based on the findings during the site inspection (letter dated September 27, 2004 from David Anderson to Russell Grubb) and 2003 annual report review:

- The N loading limit was slightly exceeded on the MU-001601 or Hatfield farm (273 lb/ac applied vs. 270 lb/ac limit). Also, the COD loading limit was slightly exceeded on MU-001607

or Miller farm (53 lb/ac-day vs. 50 lb/ac-day). According to Doug Thorson there is a long delay between the time the wastewater samples are sent to the laboratory and the analysis results are obtained. DEQ recommends that Seneca make conservative assumptions for the effluent concentration when predicting the amount of wastewater that may be irrigated.

- No evidence of wastewater overloading was found at the time of the inspection. However, based on the review of the 2003 Annual Report it appears that wastewater is unevenly distributed. Overloading ranged from 0.5 in/ac/yr at MU-001606 (Eriksen/Gulik/Martins) site to 8.1 in/ac/yr at MU-001607 (Miller) site.
- According to Doug Thorson there were no formal nuisance odor complaints received by Seneca Foods in 2003. The facility did develop and implement an odor response plan for 2003. The plan includes maintaining an odor report, monitoring meteorological conditions, and a standard operating procedure to respond to complaints if/when they occur.
- From the review of the 2003 Annual Report, it appears that the facility conducted sampling and monitoring as per permit requirements.
- The groundwater monitoring data showed exceedances of Ground Water Quality Rule (GWQR) (IDAPA 58.01.11), for the primary constituent Nitrate in Hatfield, New Buhl Implement and Pence (drilled in 2003) wells. The total iron and manganese results exceeded the secondary constituent limit in several wells, while the dissolved species were below the laboratory detection levels. Also, the TDS exceeded the limit in all wells for the sampling events performed in November and December of 2002 and June, August and October of 2003.
- In 2002 it was determined that Bausman and Hatfield wells drilled in 1995 may have not been adequate for monitoring the land application site. Consequently, in 2003 Seneca drilled four new wells to provide a more adequate groundwater monitoring network and also provide monitoring of the new management units permitted in 2002.
- Several improvements were implemented during the past couple of years. Some of the improvements are: installation of shaker screens prior to sending the wastewater to surge pond, installation of two double screens to treat the influent at the surge pond, and reduction of NVDS by sending the boiler blowdown and softener recharge water to the city of Buhl wastewater treatment plant.

On September 29, 2005 Olga Lautt from Twin Falls Regional DEQ office met with Seneca representatives and performed an inspection. Following are the comments based on the findings during the site inspection (letter dated October 20, 2005 from Olga Lautt to Russell Grubb) and 2004 annual report review:

- It appears that Seneca applied wastewater within limits of the permit during 2004 reporting year. However, the total wastewater and fertilizer loading to the management units MU-001602 (Love/HDS/Pence/BCD farms), MU-00164 (Hendrix), MU-001605 (Kaster) and MU-001606 (Martins/Gulik/Eriksen) were compared to the 250 lb N/ac limit. This methodology appears to be inaccurate. Since the crop uptake was not calculated for each management unit the comparison between nitrogen from the wastewater applied and each crop uptake could not be done.
- No evidence of wastewater overloading was found at the time of the inspection. However, based on the review of the 2004 Annual Report it appears that the wastewater is unevenly distributed. Exceedences range from 0.35 in/ac/yr at MU-001606 (Eriksen/Gulik/Martins) site to 17.75 in/ac/yr at MU-001601 (Hatfield) site.

- The facility started to collect the corn baler water into a trailer tank/slurry spreader. The baler water is injected 4 – 6 inches below the ground surface. DEQ agreed that the method presently used by Seneca is protective of the environment and human health. However, during the inspection the need for submittal of a Sludge and Solids Management Plan for review and approval was discussed.
- According to Doug Thorson, the required buffer zone distances are maintained. Due to several improvements in the irrigation system (i.e. installation of three new pivots), Seneca is preparing a proposal for alternate buffer zones.
  According to Doug Thorson there were no formal nuisance odor complaints received by Seneca Foods in 2004.The facility developed and implemented an odor response plan for 2003. The plan includes maintaining an odor report log, monitoring meteorological conditions, and a standard operating procedure to respond to complaints if/when they occur.

According to Doug Thorson all the monitoring and sampling (wastewater, groundwater, and soil) are performed according to the permit conditions. Also, from the review of the 2004 Annual Report, it appears that the facility did conduct sampling and monitoring as per permit requirements.

- Based on review of the 2004 Annual Report, there is no data available for wells MW-1 (Hatfield) and MW-2 (Busman), due to the fact that they were "either dry or did not have enough water in them to collect samples" (see page 11 of the report).
  The available groundwater monitoring data did not show exceedances of GWQR (IDAPA 58.01.11) for the primary constituent Nitrate in the sampled wells.
  With regard to the iron and manganese, Seneca analyzed for total species and also analyzed for dissolved Fe and Mn. While the total Fe and Mn results exceeded the secondary constituent limit as set in GWQR (IDAPA 58.01.11) in some wells, the dissolved Fe and Mn results are below the laboratory detection levels. It appears that the high total Fe and Mn may have been affected by the turbidity in the sample. The total Fe was high in all samples from monitoring well MW-5 (Pence) and ranged between 1.93 and 8.38 mg/L. Another secondary constituent, Total Dissolved Solids (TDS) exceeded the limit in all wells and all samples, except for the October 2004 sample in MW-3 (New Buhl Implement) and the August sample in the new well MW-7 (McDonald). The TDS ranged between 520 and 780 mg/L.

4.0 DISCUSSION

The following sections consist of a description of site conditions, such as historic and proposed site loading, soils, ground water, surface water, site management and compliance activities. All those characteristics will help determine the limiting factors of the site.

4.1 General Information

This section summarizes the permit limits currently in effect for the land application areas. For a map of the management units please refer to Figure 1 in Attachment 1. The following table contains the current permit conditions.

<table>
<tr><td rowspan="9">Permit Condition</td><td colspan="6">Limit</td></tr>
<tr><td>Sites permitted in 1995</td><td>Acres</td><td>Sites permitted in 2002</td><td>Acres</td><td>Sites permitted in 2005</td><td>Acres</td></tr>
<tr><td>MU-001601 (Hatfield)</td><td>36</td><td rowspan="2">MU-001607
(Miller)</td><td rowspan="2">72</td><td rowspan="2">MU-001609
(Paulson)</td><td rowspan="2">75</td></tr>
<tr><td>MU-001602
(Love/HDS/Pence/BCD)</td><td>235</td></tr>
<tr><td>MU-001604 (Hendrix)</td><td>126</td><td rowspan="3">MU-001608
(McDonald/Lemoyne)</td><td rowspan="3">100</td><td rowspan="3">MU-001610 (Gomez)</td><td rowspan="3">118</td></tr>
<tr><td>MU-001605 (Kaster)</td><td>75</td></tr>
<tr><td>MU-001606 (Eriksen&Gulik, Martins & Lemoyne)</td><td>224</td></tr>
<tr><td>Wastewater Total (ac-in/ac-yr)</td><td colspan="2">No limit</td><td colspan="2">Up to Irrigation Water Requirement</td><td colspan="2">Up to Irrigation Water Requirement</td></tr>
<tr><td>Inorganic TDS (NVDS) total wastewater, lb/yr</td><td colspan="2">1,290,000</td><td colspan="2">No limit</td><td colspan="2">No limit</td></tr>
<tr><td>Inorganic TDS (NVDS) only wastewater, for entire site of 696 acres lb/ac-yr</td><td colspan="2">1,850</td><td colspan="2">NA</td><td colspan="2">NA</td></tr>
<tr><td>Inorganic TDS (NVDS) wastewater and supplemental water, lb/ac-yr</td><td colspan="2">No limit</td><td colspan="2">4000</td><td colspan="2">4000</td></tr>
<tr><td>COD 1995 season during corn wastewater application, lbs/ac-day</td><td colspan="2">265</td><td colspan="2">NA</td><td colspan="2">NA</td></tr>
<tr><td>COD 1996 and on, lbs/ac-day</td><td colspan="2">Based on odor management plan, see Schedule C, Item 2</td><td colspan="2">NA</td><td colspan="2">NA</td></tr>
<tr><td>COD, growing season (214 days), lbs/ac-day</td><td colspan="2">No limit</td><td colspan="2">50</td><td colspan="2">NA</td></tr>
<tr><td>COD, growing season (91 days) peas, lbs/ac-day</td><td colspan="2"></td><td colspan="2"></td><td colspan="2">50</td></tr>
<tr><td>COD, growing season (123 days) corn, lbs/ac-day</td><td colspan="2"></td><td colspan="2"></td><td colspan="2">200</td></tr>
<tr><td>Total Nitrogen , lb/acre-yr (from all sources)</td><td colspan="2">375 (snap peas)
270 (barley)
514 (sweet corn)
150 (dry beans)</td><td colspan="2">250</td><td colspan="2">150% of crop uptake</td></tr>
</table>

4.2 Wastewater volumes

Following table shows the wastewater generated and land applied during the pea and corn seasons.

Table 2

Year	Wastewater (million gallons)							
	Peas			Corn			Total	
	Cleanup	Process	Peas Total	Cleanup	Process	Corn total	Peas and corn total	Peas/Corn % vol
1996	0.65	11.805	12.455	8.225	93.926	102.151	114.606*	12
1997	1.445	20.324	21.769	7.986	80.814	88.8	110.569	25
1998	2.091	18.785	20.876	9.452	96.587	106.039	126.915	20
1999	1.708	15.98	17.688	10.201	110.539	120.74	138.428	15
2000	2.689	23.335	26.024	14.704	133.369	148.073	174.097	18
2001	3.625	32.359	35.984	7.796	99.108	106.904	142.888	34
2002	2.367	19.094	21.461	8.641	74.067	82.708	104.169*	26
2003	1.986	18.107	20.093	8.264	69.921	78.185	98.278	26
2004	3.26	32.15	35.41	7.66	72.24	79.9	115.31	44
Max	3.63	32.36	35.98	14.70	133.37	148.07	174.10	44
Min	0.65	11.81	12.46	7.66	69.92	78.19	98.28	12
Average	2.20	21.33	23.53	9.21	92.29	101.50	125.03	24

Note: *Total peas and corn values are calculated; the reported values for years 1996 and 2002 were 120.456 million gallons and 93.162 million gallons, respectively. For all other years, the calculated and reported values were identical.

According to Seneca (draft permit comments letter from George Spinner/CES dated September 10, 2001; item 3) “the annual process water volume is projected to be 200 million gallons”. A maximum volume of 174.097 million gallons was reached during the 2000 reporting year. The wastewater volume will be limited to the crop Irrigation Water Requirement (IWR). Also, limits will be set for nutrient loadings such as nitrogen, and for COD.

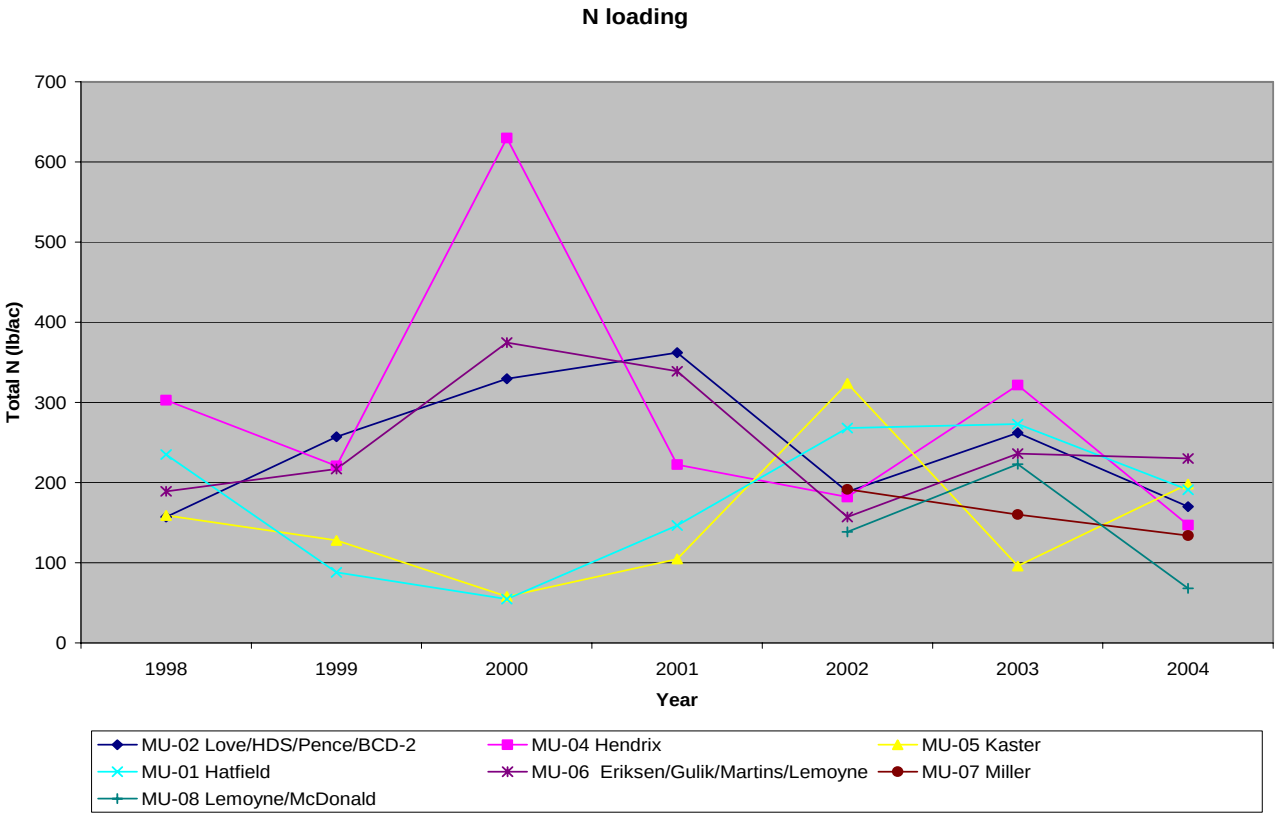
4.3 Wastewater Quality

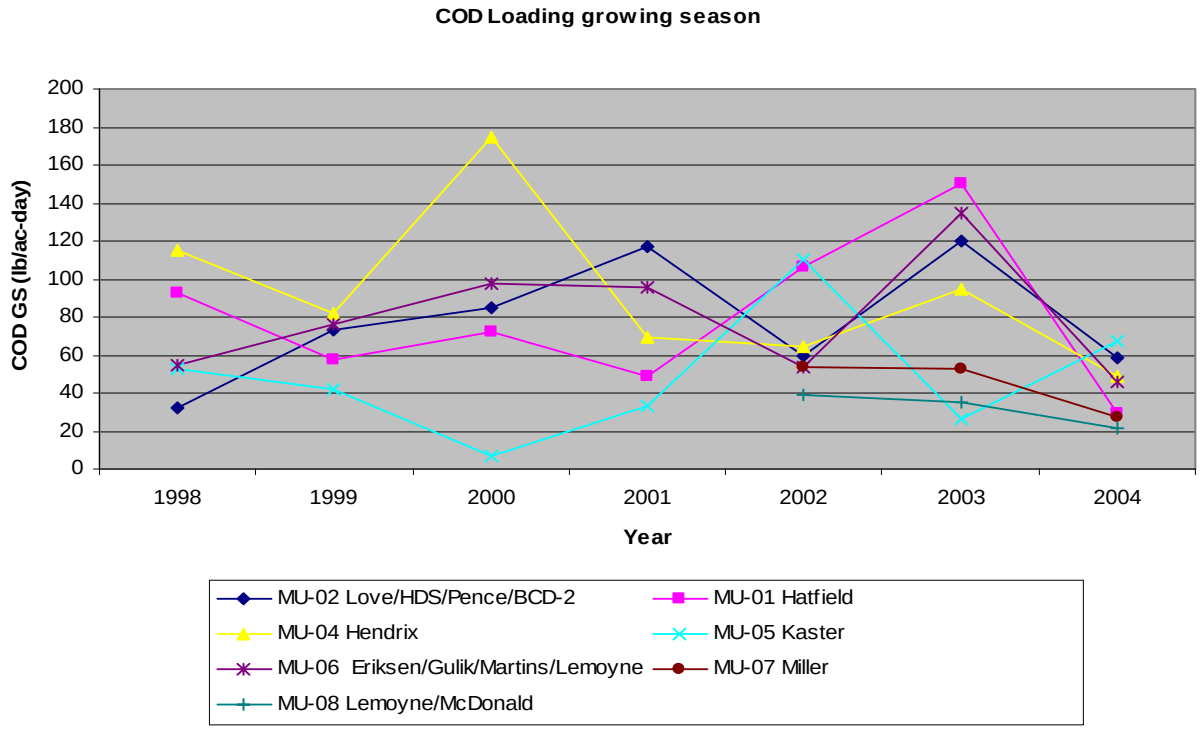
The following table summarizes the average of the wastewater concentration for years 1996 through 2004, with the exception of 2002. The information was not summarized for year 2002.

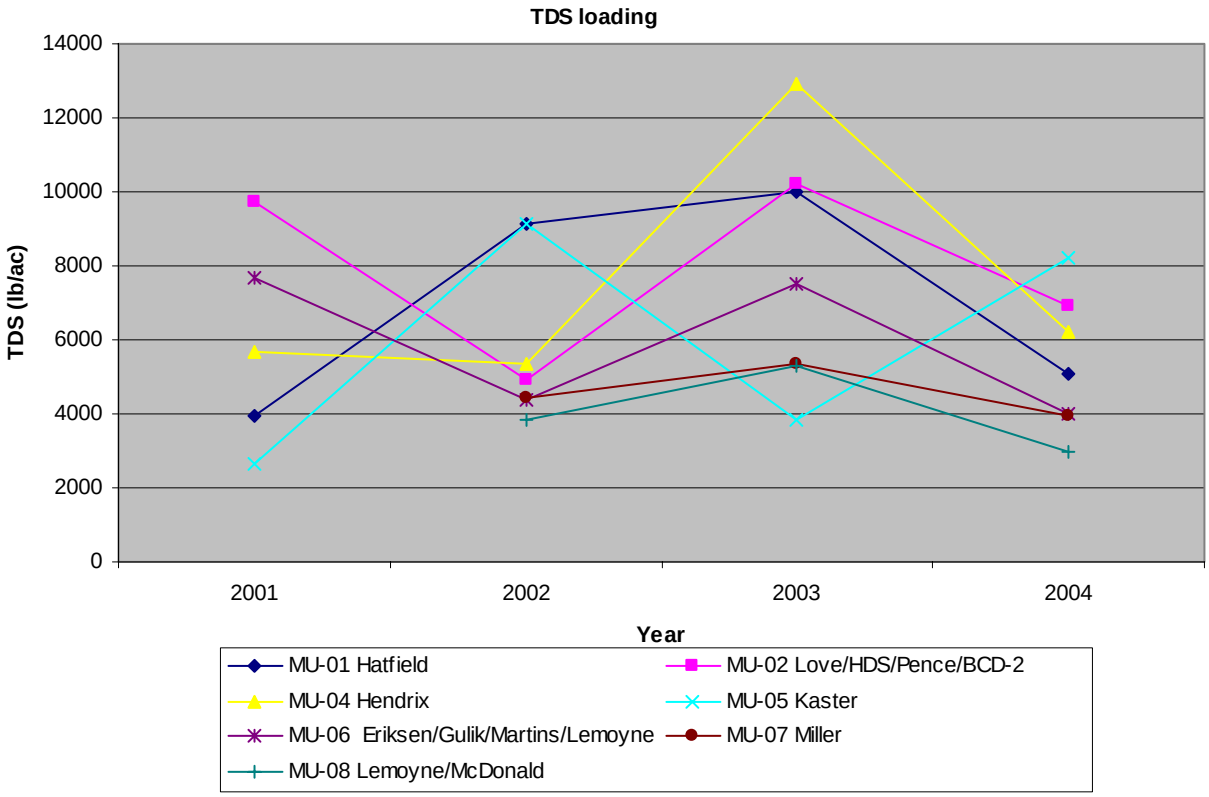
Table 3

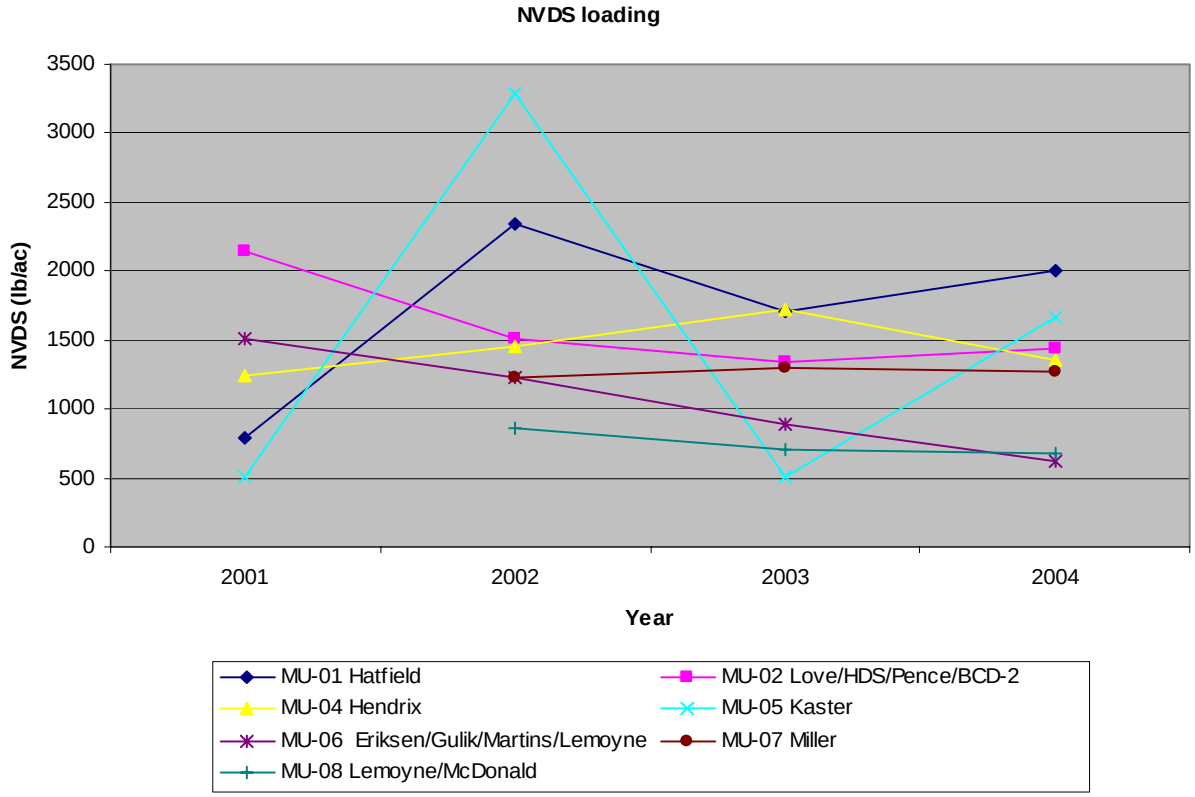
Parameter	Wastewater concentration (ppm)			
	Peas		Corn	
	Cleanup	Process	Cleanup	Process
Chemical Oxygen Demand (COD)	453	1,535	859	11,751
Total Nitrogen (N)	16	43	22	157
Total Dissolved Solids (TDS)	1,119	1,440	1,353	5,640
Volatile Dissolved Solids (VDS)	274	670	422	4,147
Non-volatile Dissolved Solids (NVDS)	844	771	931	1,493

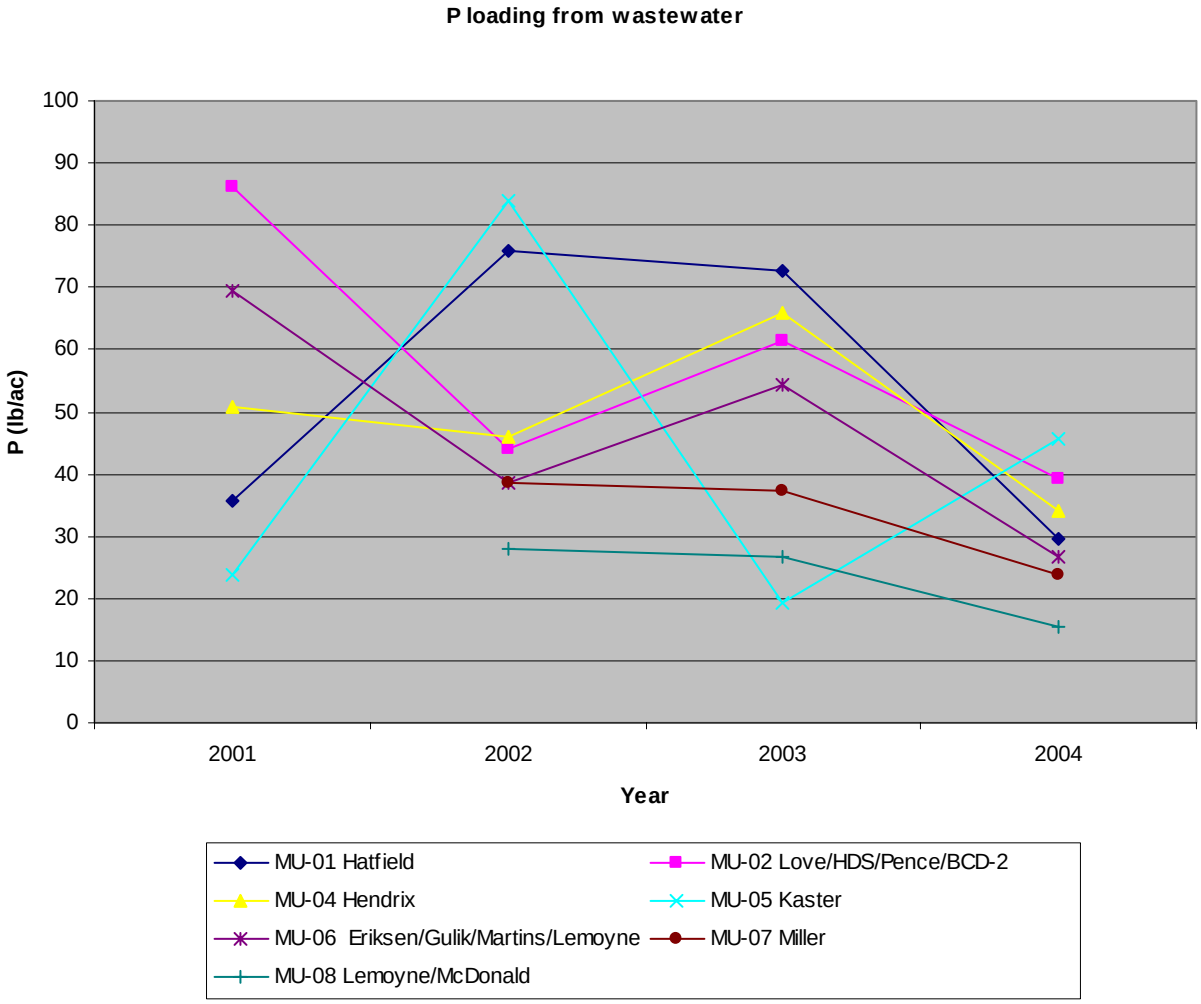
Historical loadings for current management units






TDS loading
TDS (lb/ac)
14000
12000
10000
8000
6000
4000
2000
0
2001
2002
2003
2004
Year
MU-01 Hatfield
MU-02 Love/HDS/Pence/BCD-2
MU-04 Hendrix
MU-05 Kaster
MU-06 Eriksen/Gulik/Martins/Lemoyne
MU-07 Miller
MU-08 Lemoyne/McDonald


NVDS loading
NVDS (lb/ac)
3500
3000
2500
2000
1500
1000
500
0
2001
2002
2003
2004
Year
MU-01 Hatfield
MU-02 Love/HDS/Pence/BCD-2
MU-04 Hendrix
MU-05 Kaster
MU-06 Eriksen/Gulik/Martins/Lemoyne
MU-07 Miller
MU-08 Lemoyne/McDonald



From the above charts it appears that for the majority of the sites the loadings have been steadily decreasing in the past four years. For the Kaster farm (MU-05) all the loadings increased from 2003 to 2004 reporting years. However, 2004 loading is lower compared to the previous years. Also, for MU-01 (Hatfield) the NVDS loading is higher in 2004 vs. 2003; however, the loading appears to decrease compared to the previous years.

While the volume of wastewater land applied did increase during some years when compared to 1996 (see chart in Section 4.2 Wastewater volumes), Seneca did increase the permitted acreage by approximately 22% in 2002. The addition of 172 acres (Miller and Lemoyne/McDonald farms) made possible the decrease of some loadings during the past years.

As discussed in Section 2.0 Process description, recently an additional 193 acres were permitted for wastewater land application through a permit modification. The latest land addition brings the total acreage to 1061 acres, which is a 66% increase from the permitted land in 1995 (696 acres).

4.4 Growing Season (GS) Hydraulic Requirements for Crop Need

The GS hydraulic loading rate limit is determined by the irrigation water requirement (IWR) for the crop grown and is based on the following formula:

$$IWR = [C_u - (PPT_e + \text{carry over soil moisture}) + LR]/E_i$$

Where: IWR is the irrigation water requirement or the hydraulic loading rate for the growing season
C_u is the crop consumptive use
PPT_e is the effective precipitation
LR is the leaching rate
E_i is the irrigation system efficiency

For permit purposes, the soil carry over moisture and leaching rate are assumed to be zero in calculating the IWR. Using crop irrigation requirements from *Estimating Consumptive Irrigation Requirements for Crops in Idaho*, the IWR for the crops grown is shown in following table. An average irrigation efficiency of 75% for the combination of furrow (50 to 85%) and center pivot (75-90%) irrigation system was used in calculations.

Table 4

Crop type	**IR[1] (inches)**	**E_i (%)**	**IWR (inches)**	**IWR (MG)**
Alfalfa	31.34	75	41.79	1207.4
Barley	24.8	75	33.06	955.2
Peas	10.59	75	14.12	408
Sweet corn	16.18	75	21.57	623.3
Beans	14.05	75	18.73	541.3
Winter Wheat	25.27	75	33.69	973.5

1. The Irrigation Requirement (IR) is equal to crop consumptive use minus effective precipitation ($C_u - PPT_e$). The IR data is derived from the Castleford 2N weather station data located at: http://www.kimberly.uidaho.edu/water/appndxet/index.shtml

The IWR for alfalfa for the entire area (1061 acres) is approximately 1207.4 million gallons. The facility generated and land applied a maximum of 174 million gallons during the year 2000, which is approximately 14.4% of the IWR. The remainder of the IWR should be provided by supplemental irrigation water.

At the time of drafting the permit the facility does not anticipate that wastewater will be generated during the non-growing season. Consequently land application will be allowed only during the growing season.

4.5 Soils

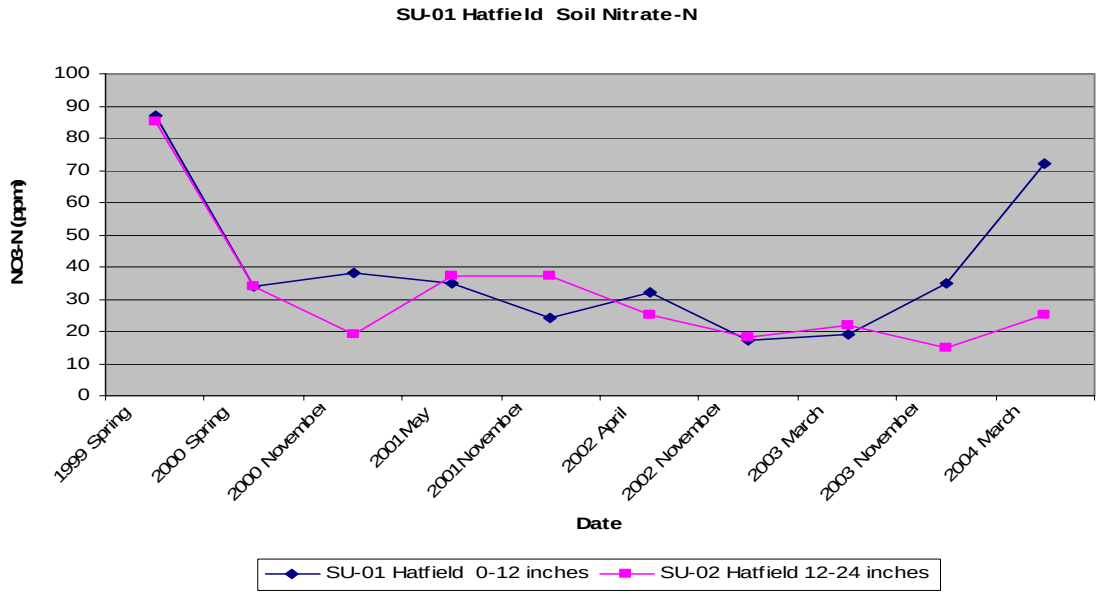
Based on the "Soil Survey of Jerome County and part of Twin Falls County" following are the soil types found at the land application site: Portneuf, Minevo and Sluka. The soil survey map for Seneca Foods shows that the majority of the land application site is covered with Minveno and Sluka type soils. Those soil types fall into severe rating criteria, due to the shallow depth (20 inches to 3 feet). Therefore, late season wastewater application should utilize the fields containing the deeper soil types as much as possible to minimize leaching potential.

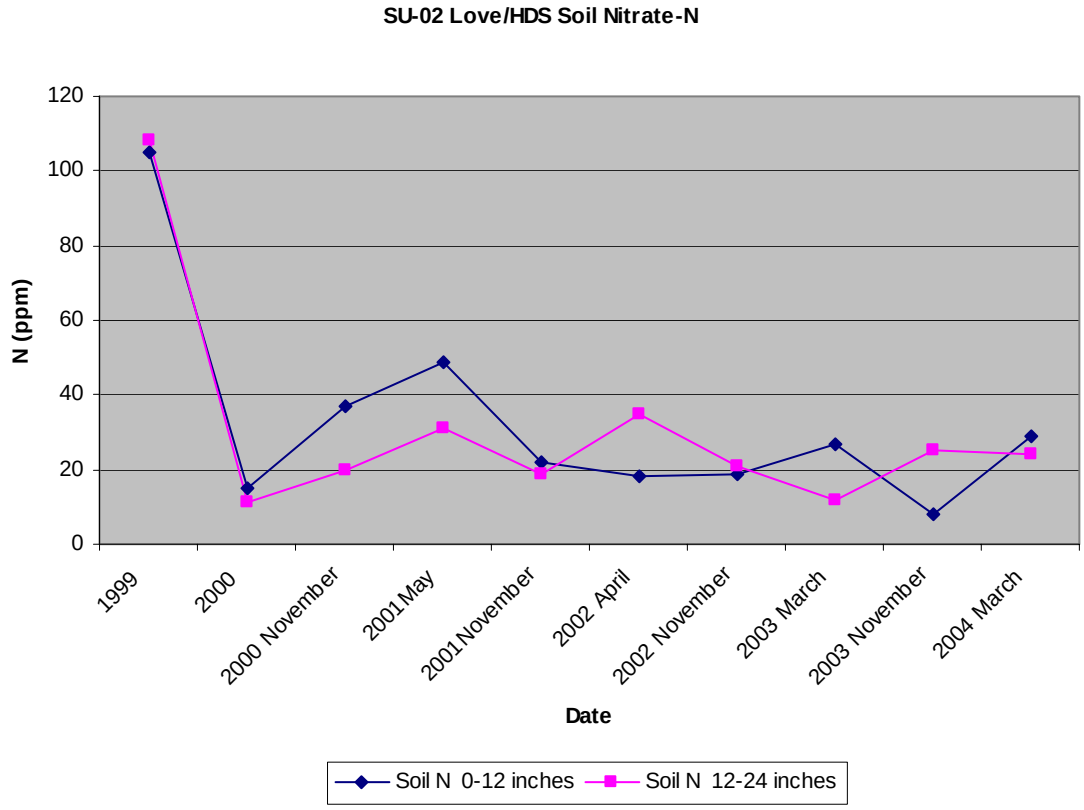
Minveno soils are shallow to a hardpan, well drained, with a moderate permeability and the water holding capacity of 2.5 to 4.0 inches. Sluka soils are moderately deep to a hardpan, well drained, with a moderate permeability and the water holding capacity of 3 to 6 inches. Portneuf soils are deep to very deep, well drained, with a moderately slow permeability and the water holding capacity of 10.5 to 11.5 inches.

The current permit requires that semi-annual soil samples are collected and analyzed at the land application site. Following charts are showing the historical data for the N, EC (electro-conductivity) soil concentrations for the first two feet of soil at the management units.

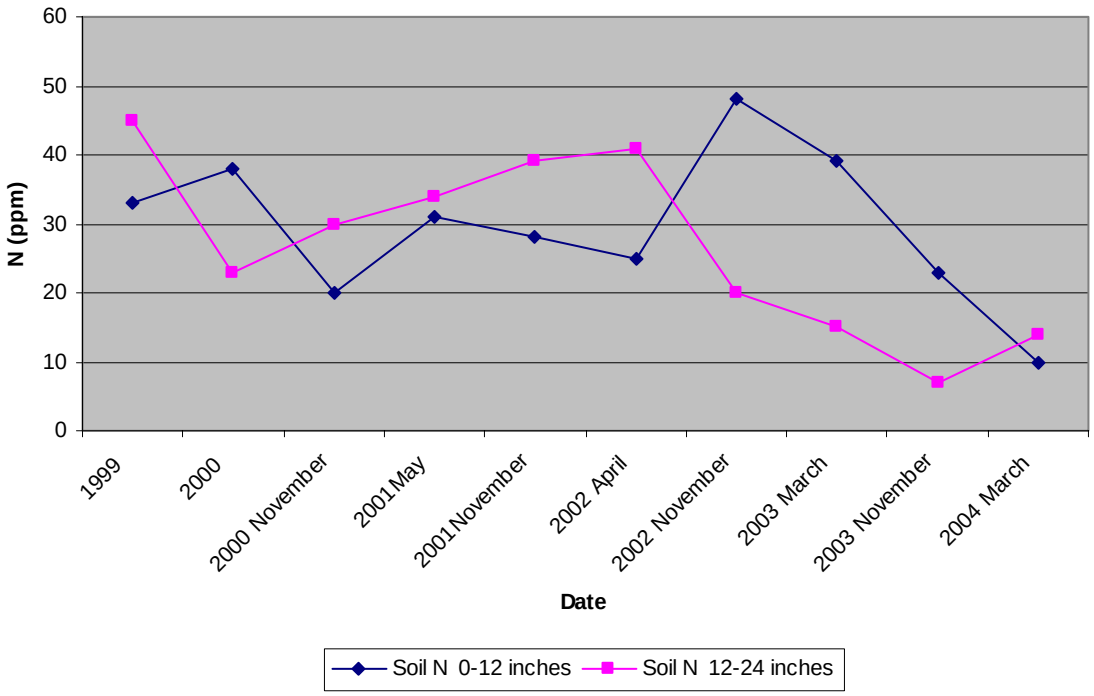
4.5.1 Soil Nitrate-N

Based on the data collected between spring of 1999 and spring of 2004, it appears that in the first foot the soil N concentrations appear to decrease for the majority of the soil units, with exception of Hatfield (SU-01) and Eriksen/Gulik (SU-07). Spikes are noted in Pence (SU-03) November 2002 sample, Kaster (SU-05) March 2003 sample and Martins/Lemoyne (SU-06) November 2002 and November 2003 samples. In the second foot the soil N concentrations appear to be moderate (between approximately 10 and 40 ppm) and decreased in the majority of the soils sampled. The exceptions were Martins/Lemoyne (SU-06) and Eriksen/Gulik (SU-07). The facility should prepare yearly a mass balance for nitrogen for each soil unit. The mass balance should compare the N in soil samples, N loading from wastewater and fertilizer with the crop N requirement and uptake.

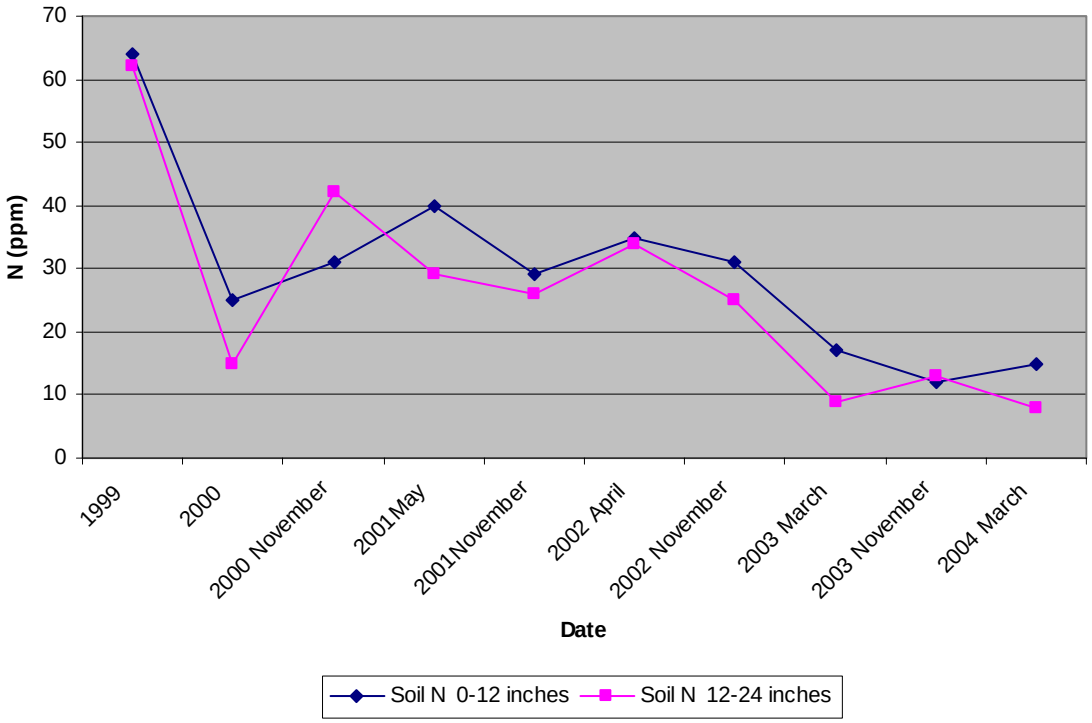

SU-01 Hatfield Soil Nitrate-N
NO3-N (ppm)
100
90
80
70
60
50
40
30
20
10
0
1999 Spring
2000 Spring
2000 November
2001 May
2001 November
2002 April
2002 November
2003 March
2003 November
2004 March
Date
SU-01 Hatfield 0-12 inches
SU-02 Hatfield 12-24 inches

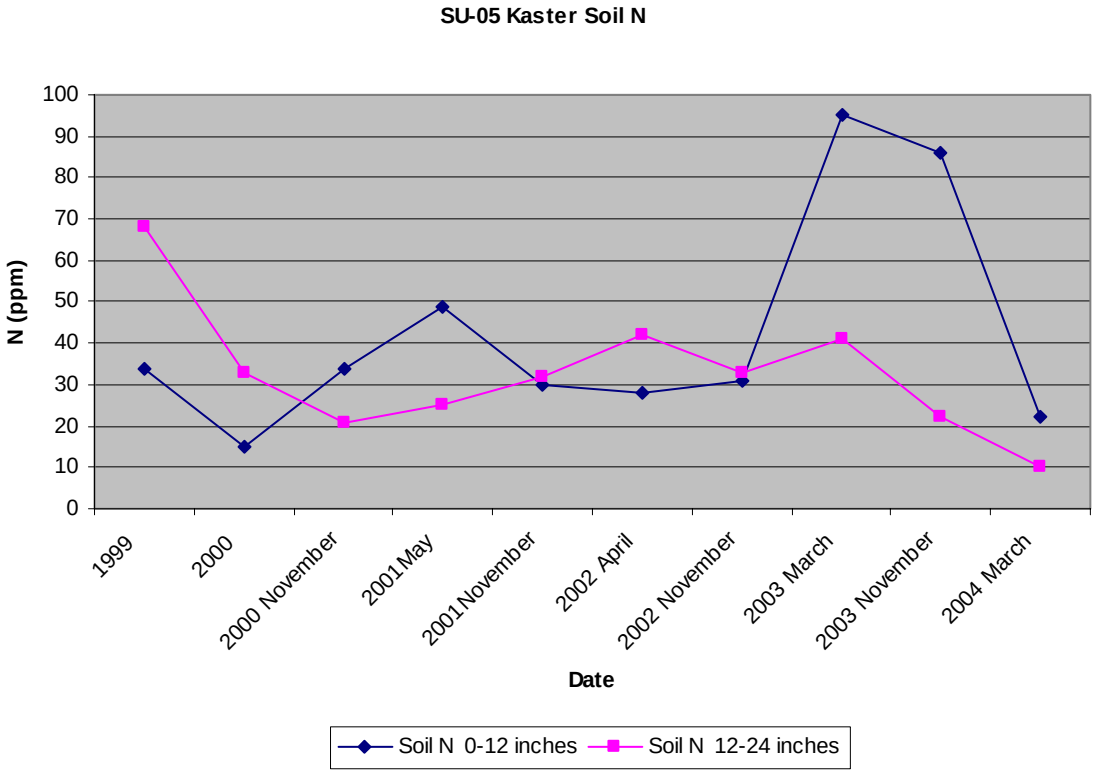

SU-02 Love/HDS Soil Nitrate-N
N (ppm)
120
100
80
60
40
20
0
1999
2000
2000 November
2001 May
2001 November
2002 April
2002 November
2003 March
2003 November
2004 March
Date
Soil N 0-12 inches
Soil N 12-24 inches

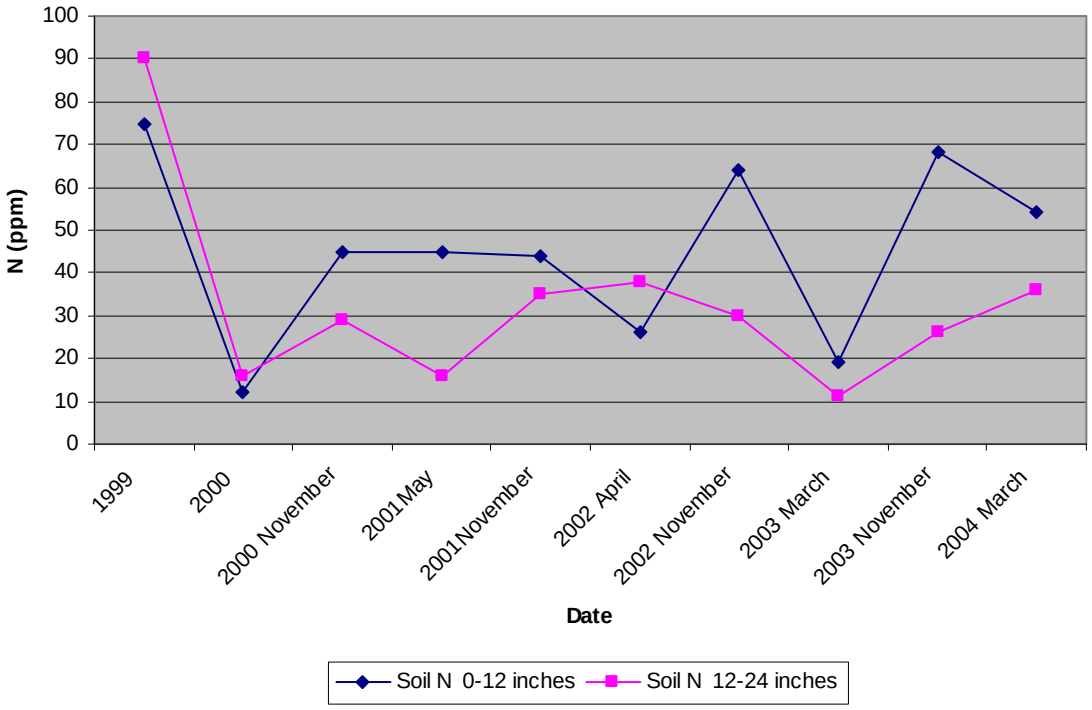
SU-03 Pence Soil N



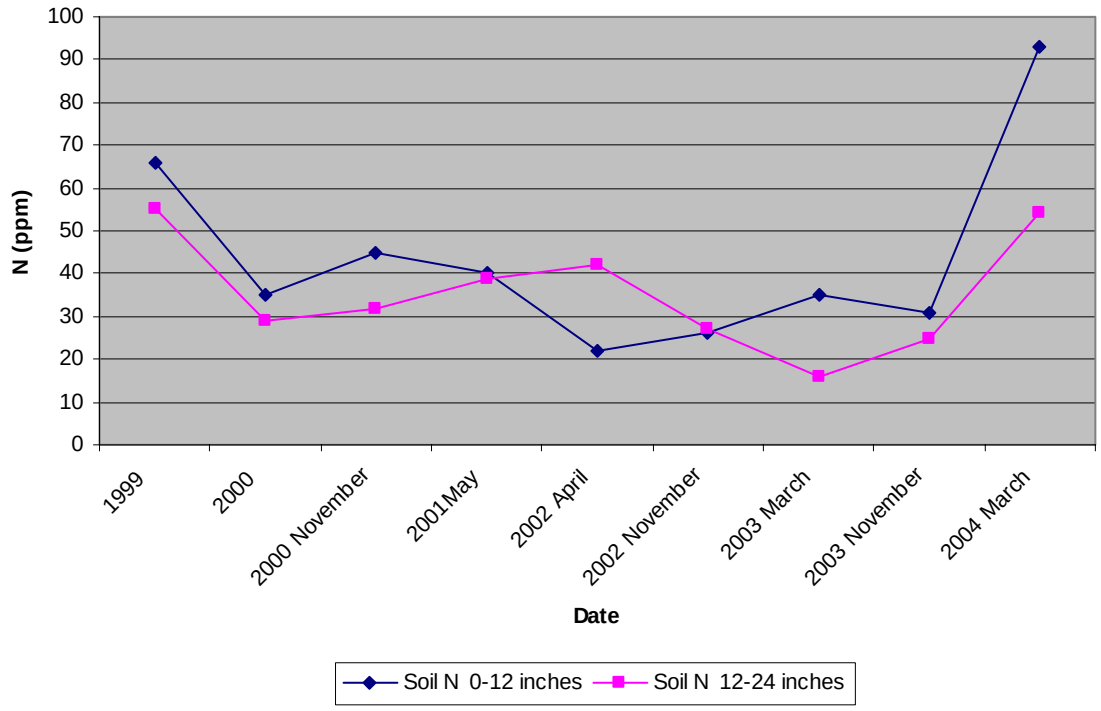
SU-04 Hendrix Soil N



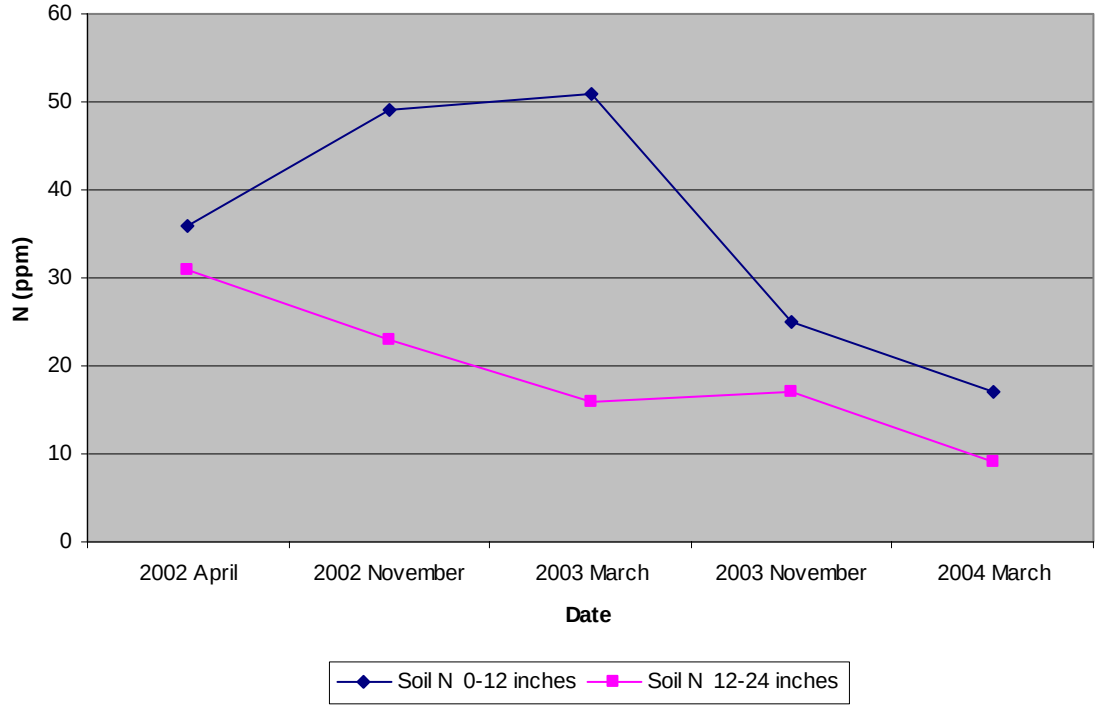

SU-05 Kaster Soil N
N (ppm)
100
90
80
70
60
50
40
30
20
10
0
1999
2000
2000 November
2001May
2001November
2002 April
2002 November
2003 March
2003 November
2004 March
Date
Soil N 0-12 inches
Soil N 12-24 inches

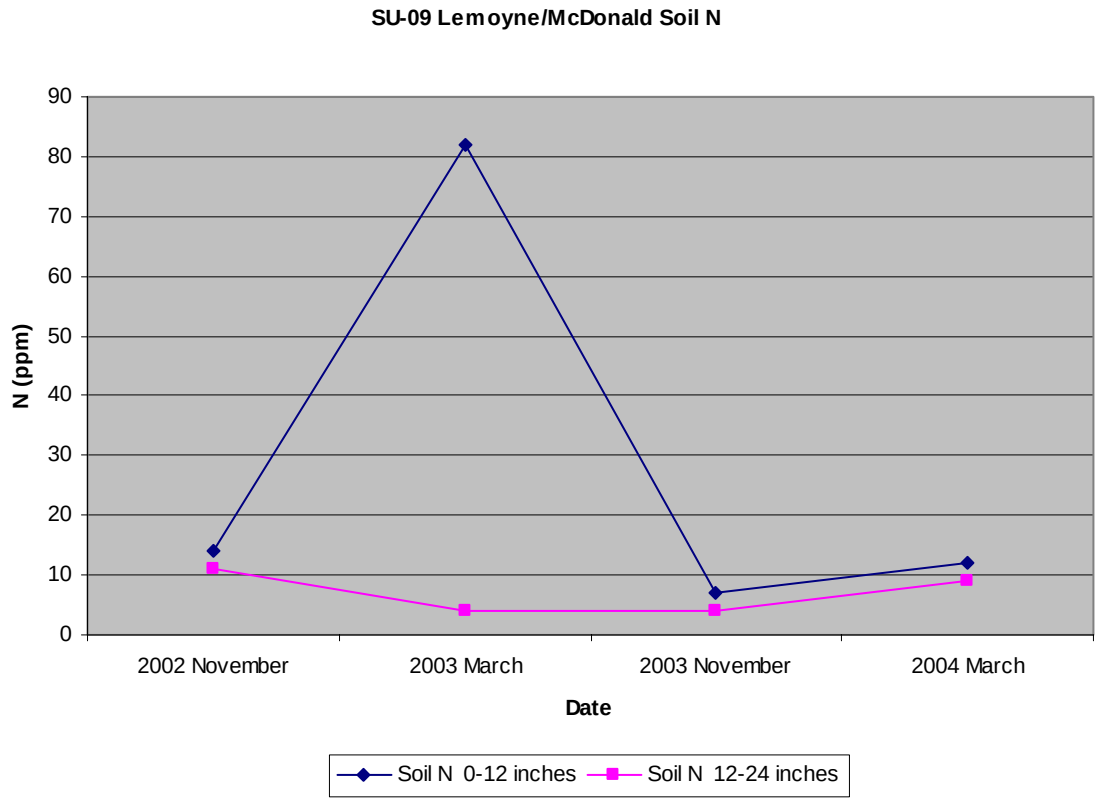

SU-06 Martins/Lemoyne Soil N
N (ppm)
100
90
80
70
60
50
40
30
20
10
0
1999
2000
2000 November
2001May
2001November
2002 April
2002 November
2003 March
2003 November
2004 March
Date
Soil N 0-12 inches
Soil N 12-24 inches

SU-07 Eriksen/Gulik Soil N



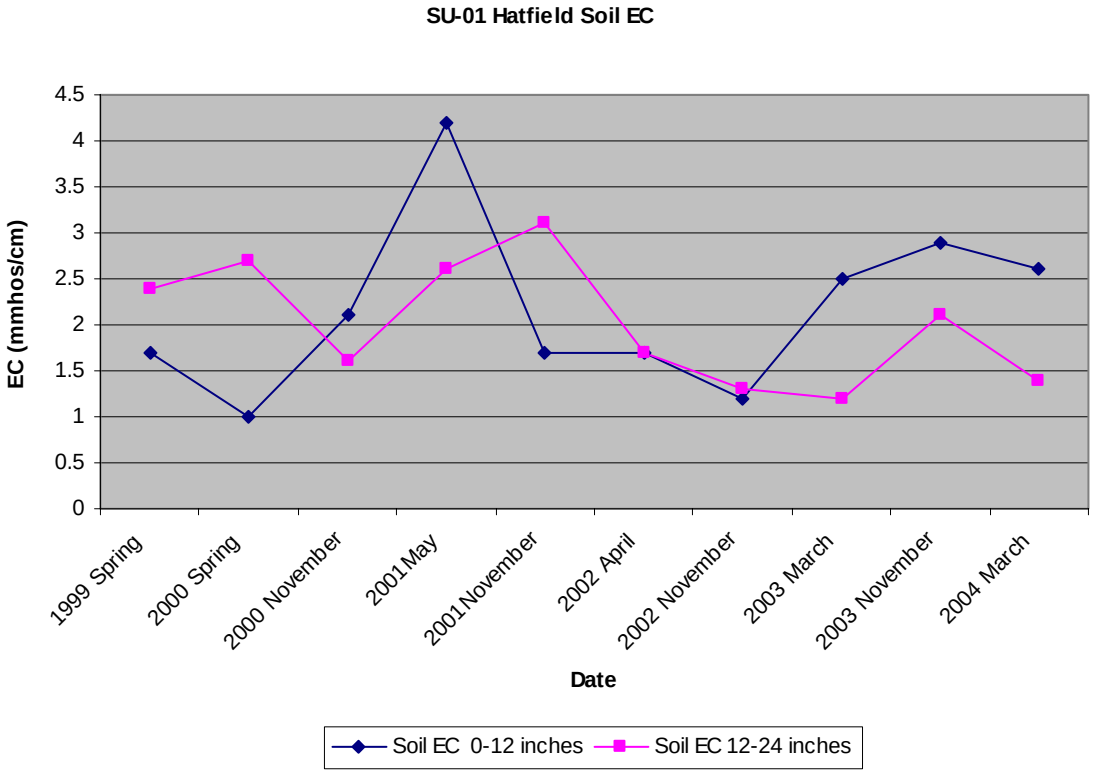
SU-08 Miller Soil N

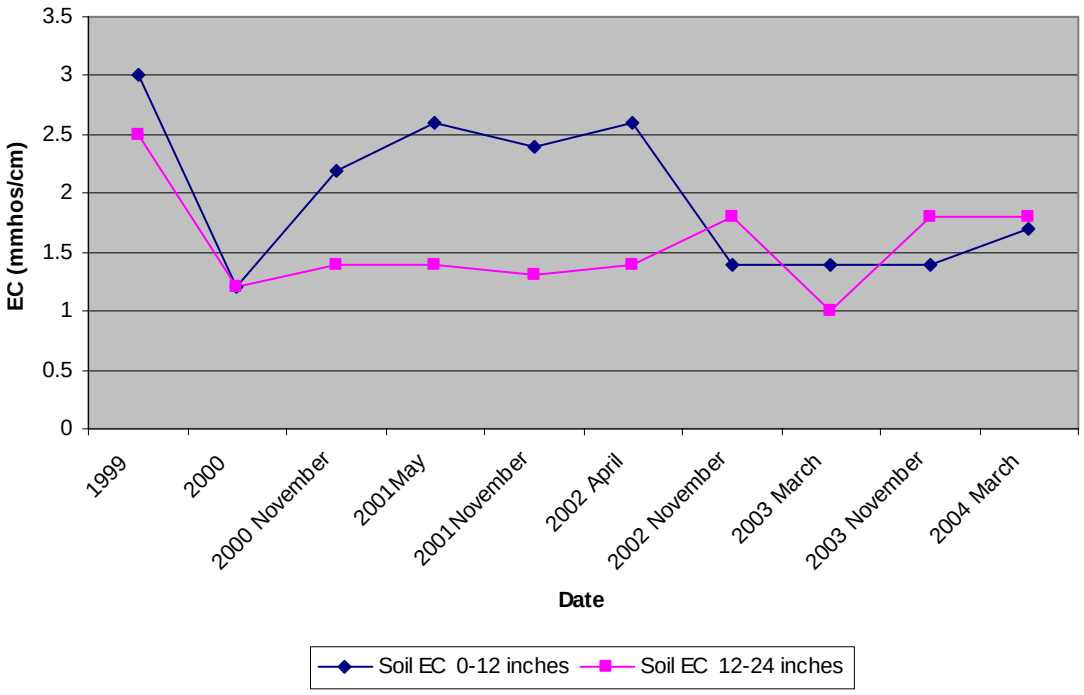




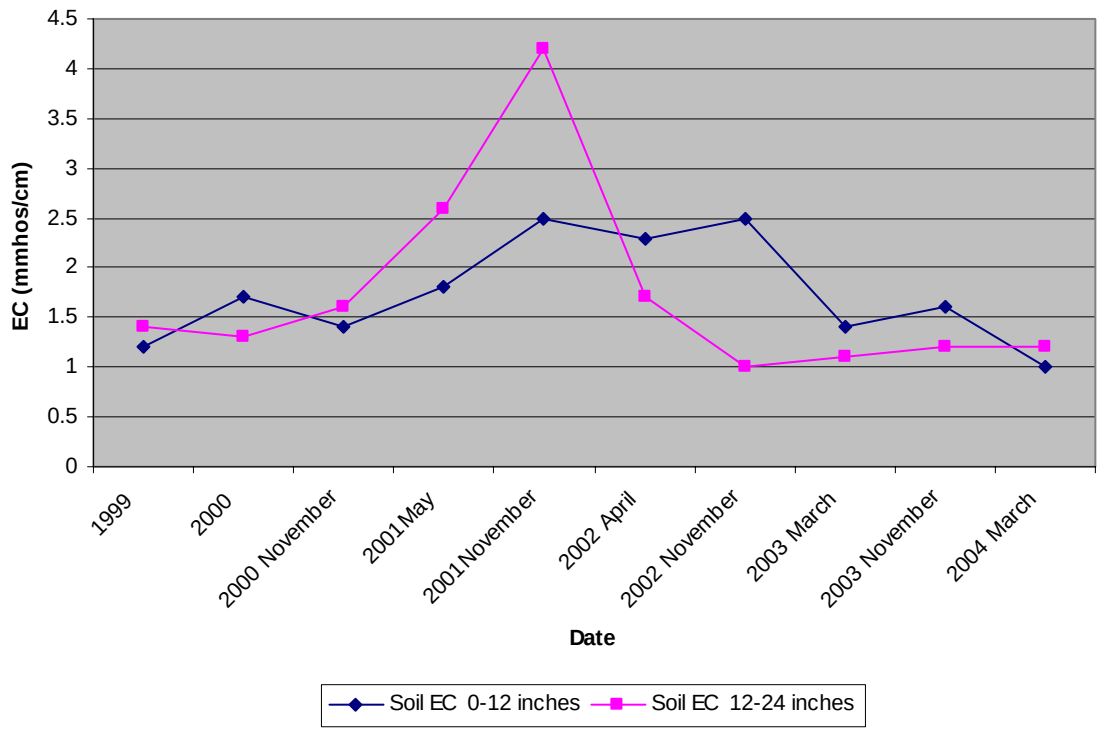
4.5.2 Soil Electroconductivity (EC)

According to the data collected between spring of 1999 and spring of 2004, the soil sample EC was in the very low (<20 mmhos/cm) to low (20 to 4 mmhos/cm) classification. The new permitted farms Miller (SU-08) and Lemoyne/McDonald (SU-09) were irrigated with wastewater for the first time in 2002. It appears that for the first foot layer most of the soil salinity in general decreased in the majority of the soil units. Exceptions are Hatfield (SU-01) and Eriksen/Gulik (SU-06). The EC soil concentrations are showing spikes in Hendrix (SU-04) November 2002 and November 2003, Kaster (SU-05) in March and November 2003, and Martins/Lemoyne (SU-06) in November 2002 and November 2003. In the second foot soil salinity appears to have decreased. However, during the November 2003 the concentrations spiked in the majority of the soil samples.

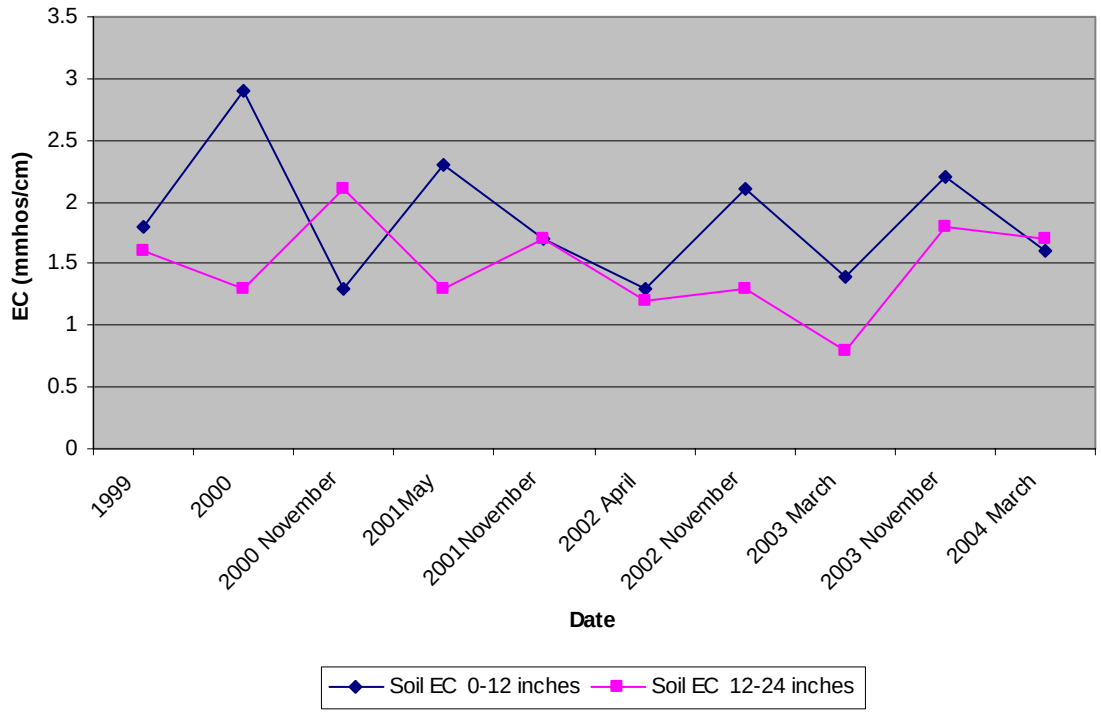

SU-01 Hatfield Soil EC
EC (mmhos/cm)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1999 Spring
2000 Spring
2000 November
2001May
2001November
2002 April
2002 November
2003 March
2003 November
2004 March
Date
Soil EC 0-12 inches
Soil EC 12-24 inches


SU-02 Love/HDS Soil Electroconductivity
EC (mmhos/cm)
3.5
3
2.5
2
1.5
1
0.5
0
1999
2000
2000 November
2001May
2001November
2002 April
2002 November
2003 March
2003 November
2004 March
Date
Soil EC 0-12 inches
Soil EC 12-24 inches

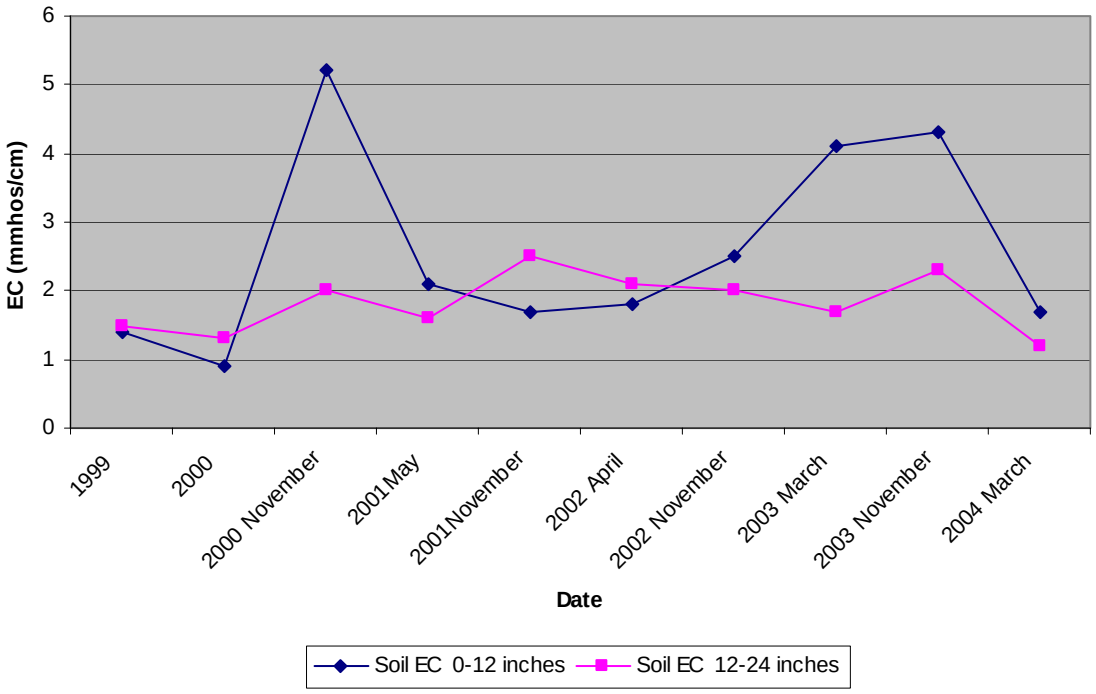
SU-03 Pence Soil Electroconductivity



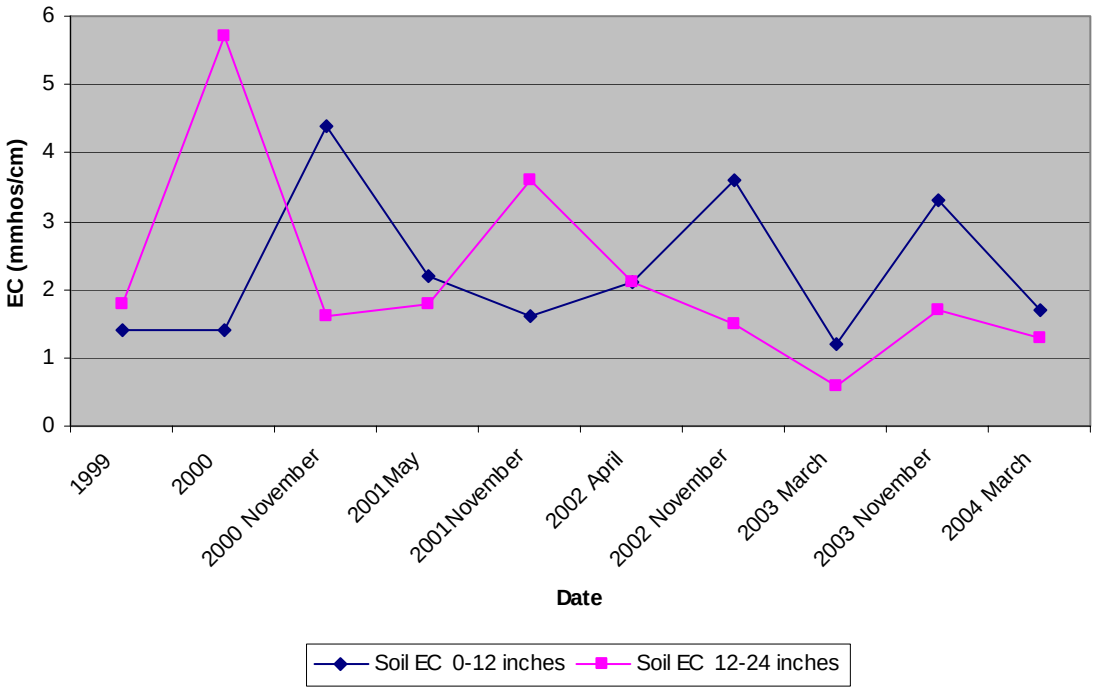
SU-04 Hendrix Soil Electroconductivity



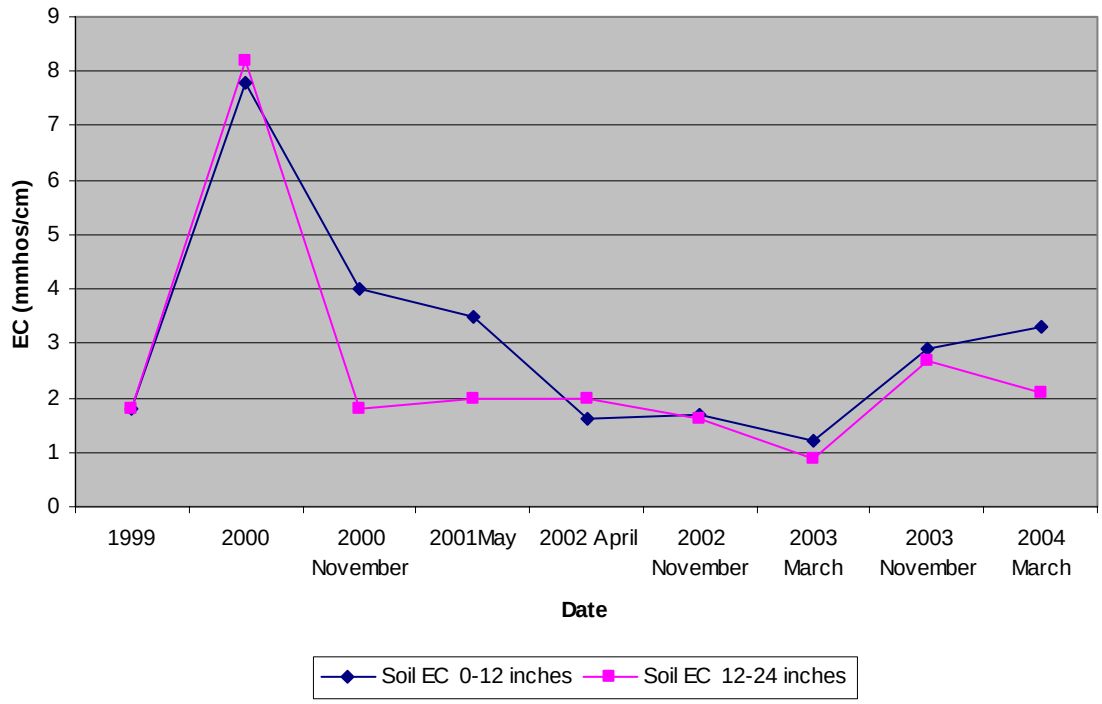
SU-05 Kaster Soil EC



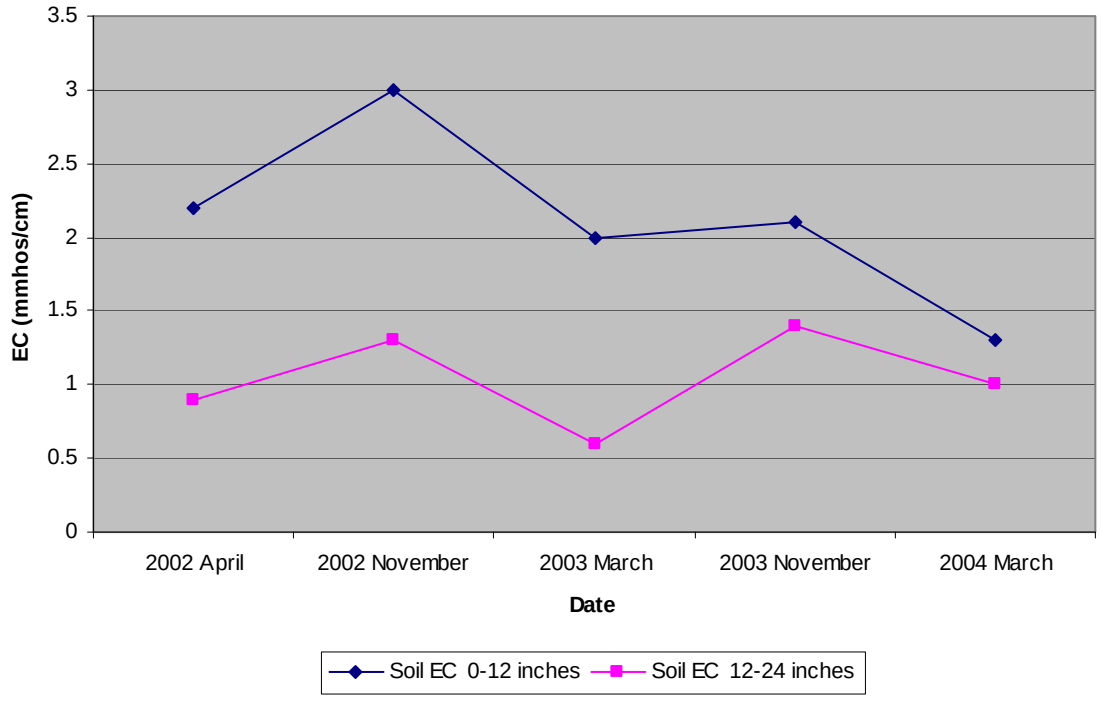
SU-06 Martins/Lemoyne Soil EC

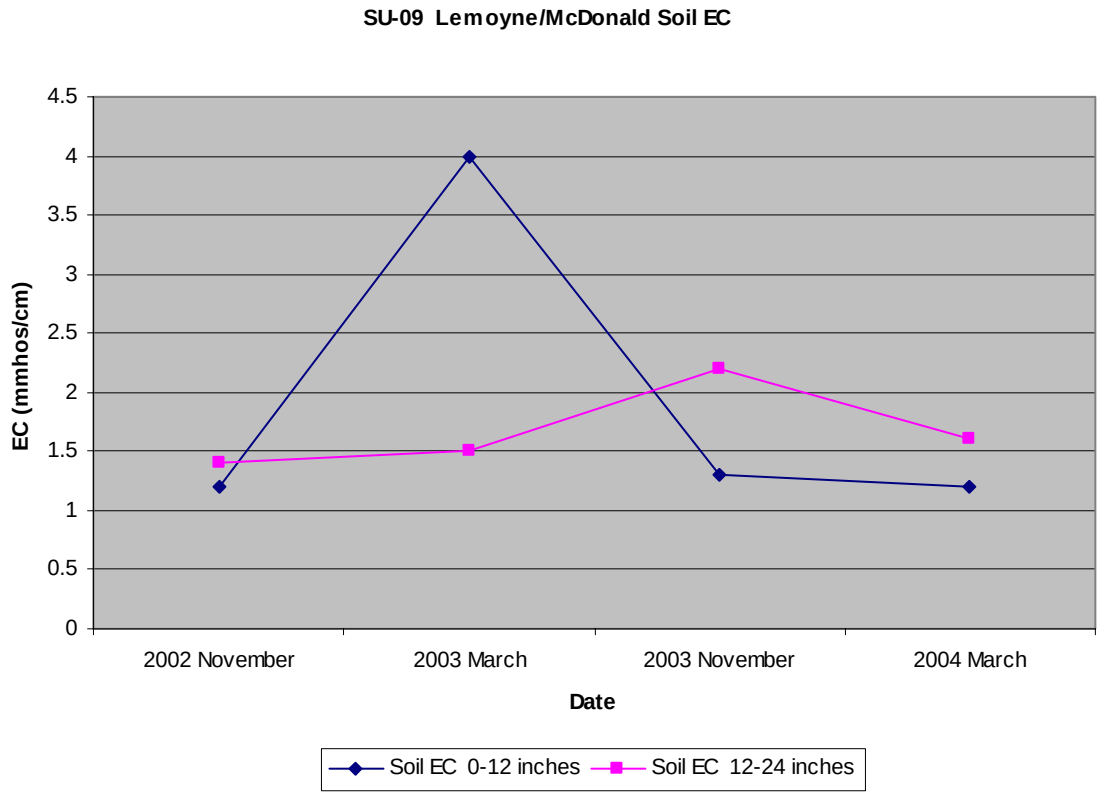


SU-07 Eriksen/Gulik Soil EC



SU-08 Miller Soil EC





4.5.3 Soil phosphorus (P)

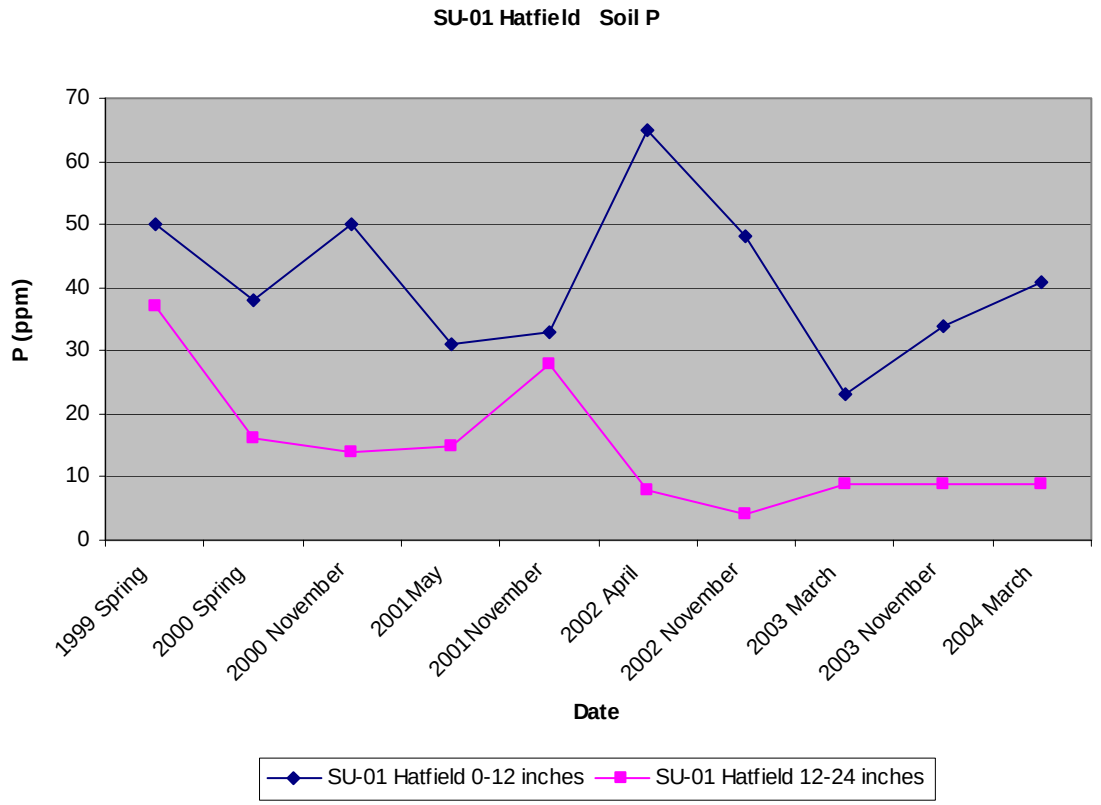
According to the data collected between spring of 1999 and spring of 2004, it appears that the phosphorus increased in the first foot of the soil samples for the majority of the soil units. The exceptions were Miller (SU-08) and Lemoyne/McDonald (SU-09) farms, where the phosphorus decreased from 48 to 15 ppm between November 2002 and March 2004. The other new permitted Miller farm showed a decrease by approximately 60% in the first foot sample from 48 to 19 ppm, between November 2002 and November 2003. For the second foot the soil P concentrations decreased in the majority of the samples, with the exception of Love/HDS (SU-02) that increased from 5 ppm in March 2003 to 29 ppm in March 2004.

For ground water greater than 5 feet below land surface, the "critical" P concentration value measured in the 24-36 inches soil layer, is 30 ppm P Olsen method (soils with pH>6.5 or calcareous soils with >2% $CaCO_3$). Currently there is no available information that an interconnection between groundwater and surface water exists. Also, there is no qualitative data available for the third foot soil layer. However, it appears that in the second foot soil layer the P is below 30 ppm. Additional information needs to be collected.

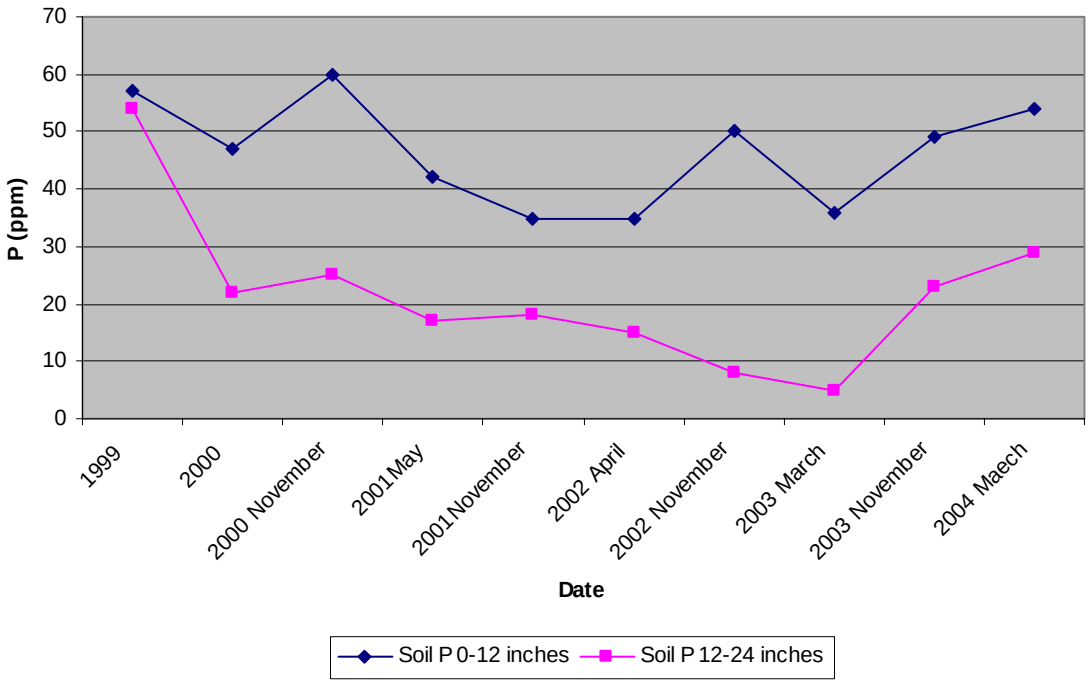
According to Joe Baldwin (Environmental Hydrogeologist, DEQ-Technical Services) there is information for an interconnection between ground water and surface water. For ground water on the south side of the river, potentiometric data show that the direction of ground water movement is from

south to north, towards the river. Stream gauging efforts conducted by the USGS and Idaho Power (Hortness and Vidmar, 2003) show that flow in the river increases from Kimberly to Bliss. While most of this increase in discharge is from north side springs, there is some ground water discharge to the river from south side springs. It is estimated that around 20 percent of the river gain in the mid-Snake reach is from ground water discharging from the south. If there is any phosphorus in south side ground water, it eventually will end up in the river. For the Buhl area the ground water flow velocity is on the order of 1 to 3 feet per day, so ground water from beneath the site could reach the river as soon as 15 to 20 years.

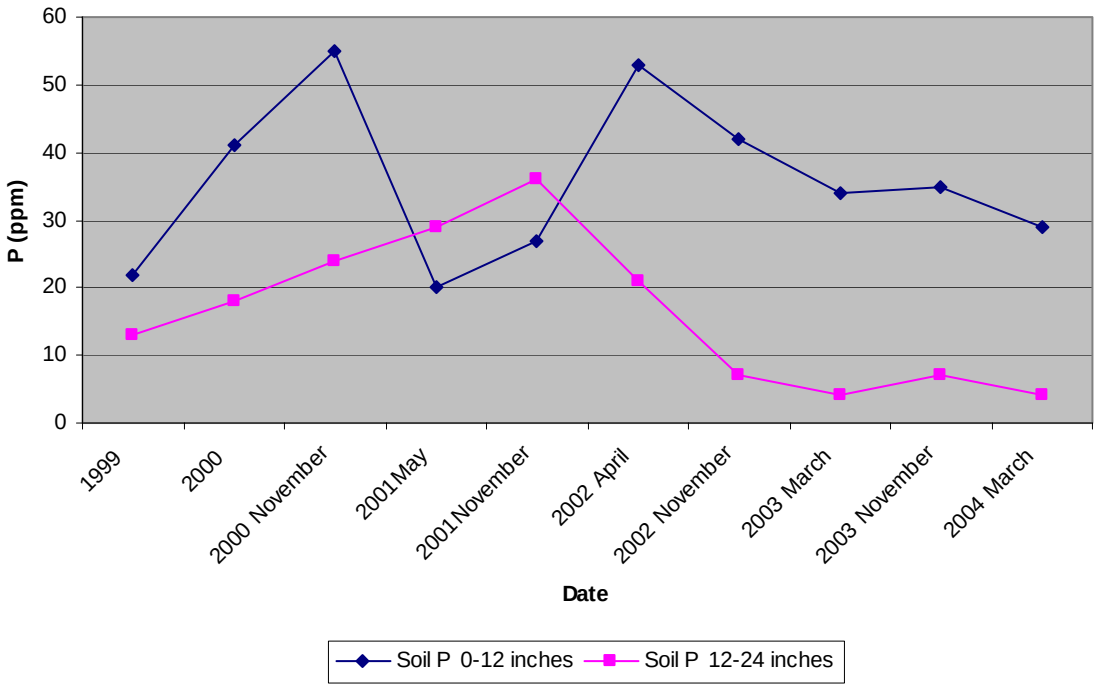
Ground water phosphorus data from the monitoring wells has been collected starting in August 2003 and there are 6 data points. However, this does not provide enough information to do a statistical comparison of up gradient and down gradient wells. Therefore additional data needs to be gathered.



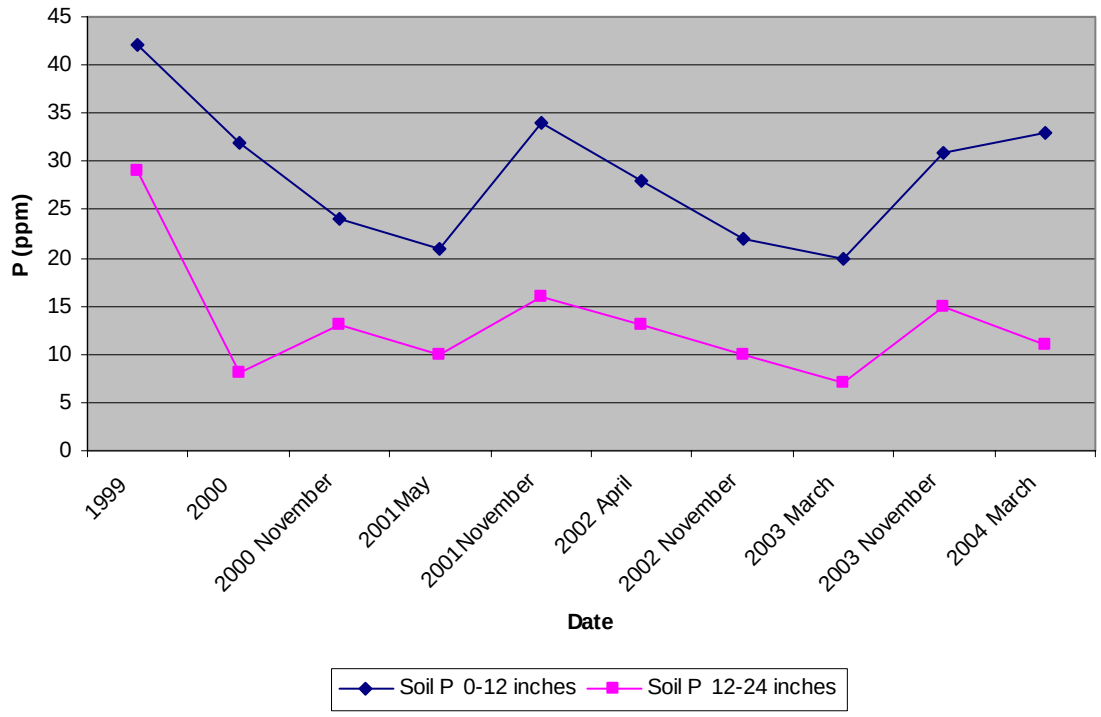
SU-02 Love/HDS Soil P



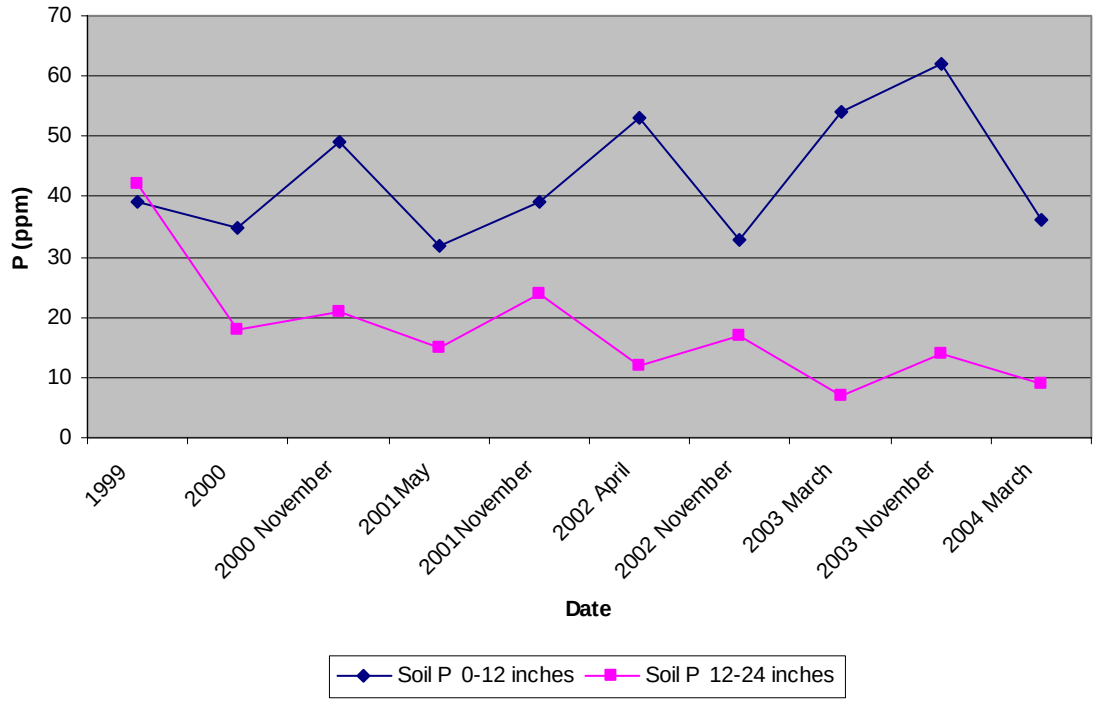
SU-03 Pence Soil P



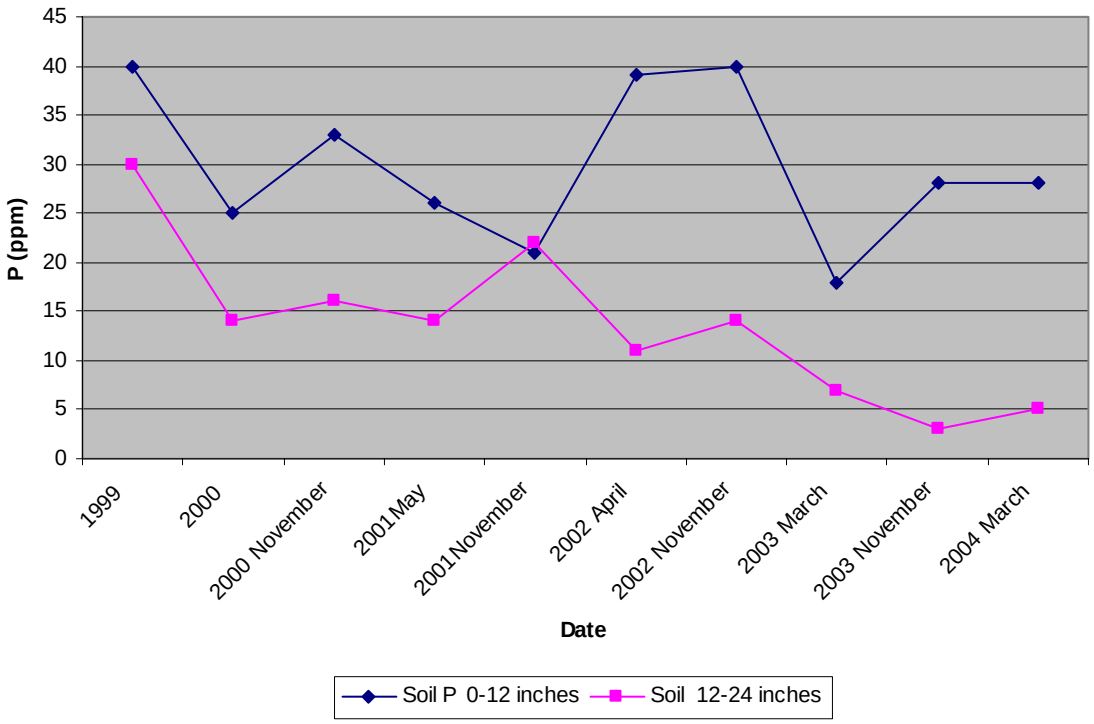
SU-04 Hendrix Soil P



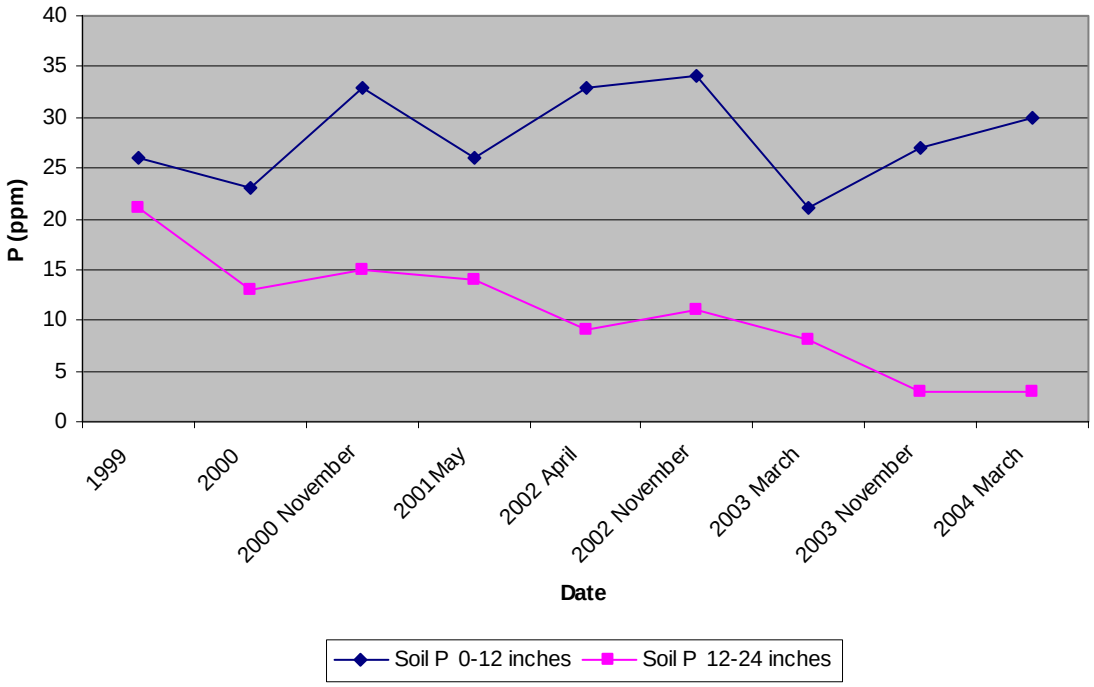
SU-05 Kaster Soil P



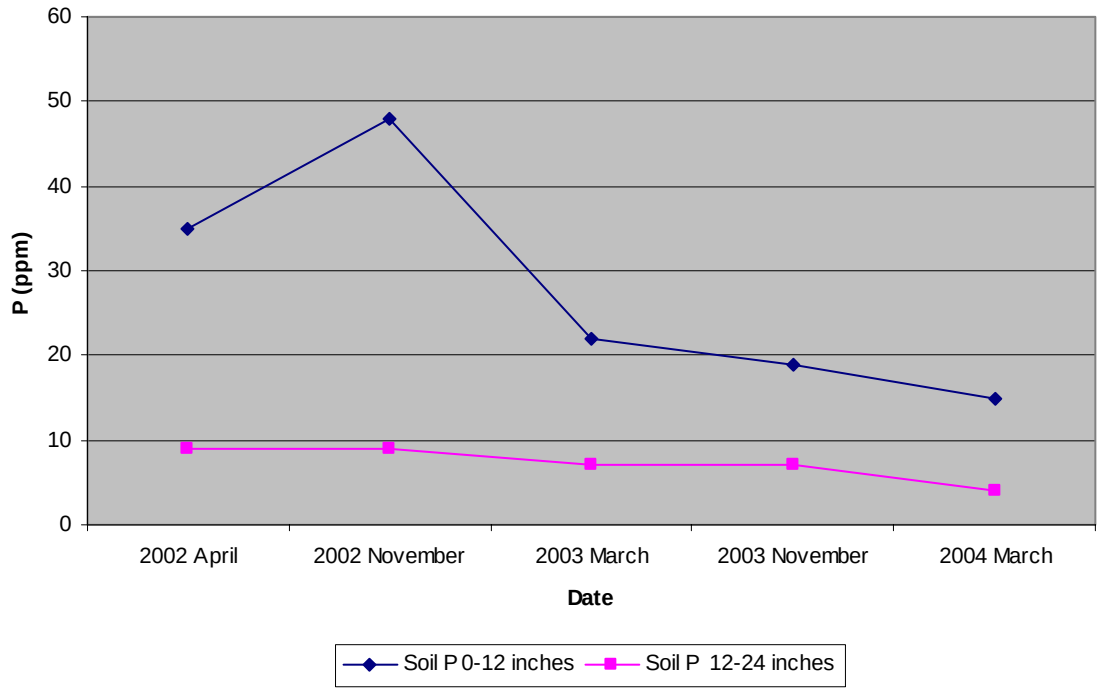
SU-06 Martins/Lemoyne Soil P



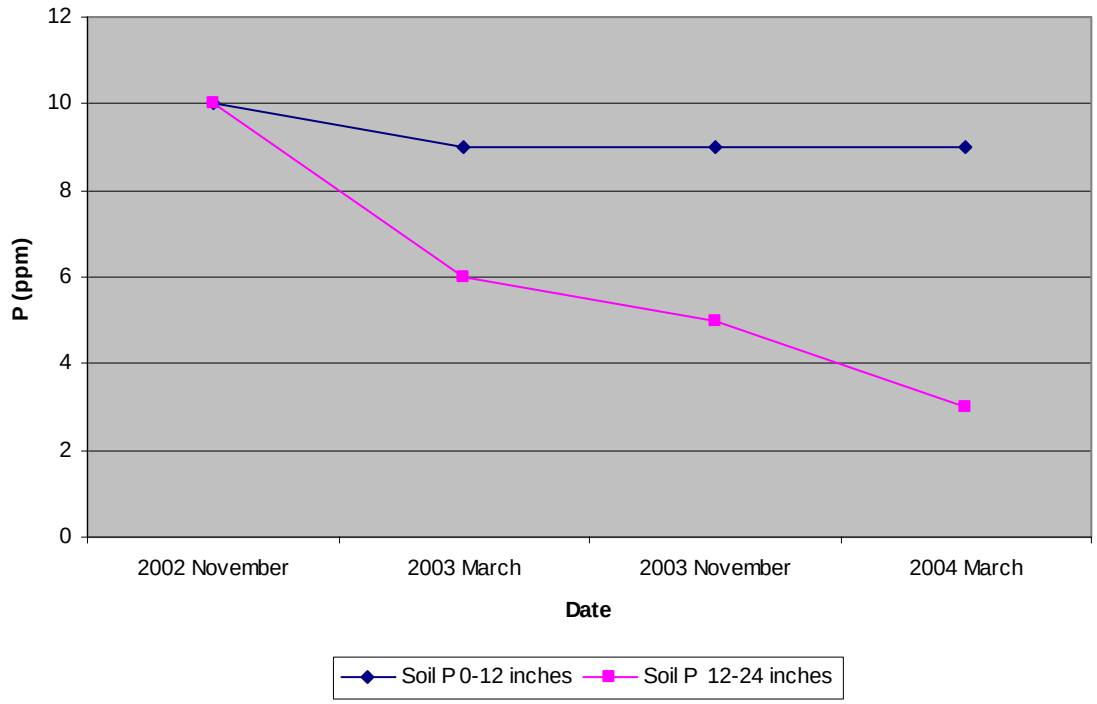
SU-07 Eriksen/Gulik Soil P



SU-08 Miller Soil P



SU-09 Lemoyne/McDonald Soil P



The soil Fe and Mn concentrations are discussed in the "Response to Seneca Foods Inc. comments on the draft permit modification LA-000016-02, Appendix "D" attached to the permit modification dated September 15, 2005.

Staff recommends that soil sampling frequency be maintained (twice per year, April and November) for all the management units. Also, the sampling and analysis shall be performed for the third foot soil layer in addition to the first and second foot.

4.6 Groundwater

Based on the findings presented in the staff analysis dated April 6, 1995 the groundwater in the area exists in three aquifer systems: a perched aquifer, a regional cold water aquifer, and a thermal water aquifer. However, based on information provided in the "Work Plan for Well Drilling Services, May 2003", prepared by George Spinner (Managing Scientist, CES) the "perched zone reported in the early studies may no longer be present in the area, and the existing monitoring wells at Seneca Foods land application site that were drilled between 56 feet to 70 feet below the ground surface may actually be completed in the top of the regional aquifer".

According to the current operating permit three (3) monitoring wells are required to be monitored (as established in the December 1995, Addendum 1- Ground Water Monitoring Plan): GW-001608 (Busman), GW-001609 (Hatfield) and GW-001610 (New Buhl Implement). In 1996, the ground water flow direction was reported to be north-northwest (CH2MHill). However, recent static water levels measurements (November 2001 and October 2002) show a flow direction approximately north-northeast. Two of the existing monitoring wells (Busman and Hatfield) were dry most of the reporting year for 2002 (Work Plan, May 2003). Also, additional acreage was permitted for wastewater land application and it was thus determined that the existing wells did not provide an adequate monitoring network for the site.

On May 7, 2003 a proposal for installation of additional wells (Work Plan for Well Drilling Services) was submitted by CES. The plan was reviewed (Joe Baldwin's Memorandum to Olga Lautt) and approved by DEQ (see letter from David Anderson to Russ Grubb, dated May 19, 2003). Following are conclusions of Joe Baldwin's memorandum: "The proposed well locations and construction details as presented in the Work Plan are approved. Based on information provided in the Work Plan, the proposed monitoring well depths should be in the range of 60 to 85 feet. A Well Location Acceptability analysis should be conducted for domestic wells within a one-quarter mile radius of the site. Since the site is located within a nitrate priority area, site nutrient, hydraulic and TDS loading should be reviewed to insure that ground water impacts from facility operations will not occur. Additional upgradient monitoring well(s) may be required after the proposed wells are installed and data are evaluated". During May and June 2003, four (4) new wells were installed at the land application site. A report titled "Groundwater Monitoring Plan, August 2003" was submitted to DEQ on September 3, 2003. The report describes how the wells were drilled and constructed, gives information regarding the ground water conditions and provides guidance/protocols for sampling the monitoring wells.

Following table shows the monitoring wells that are currently monitored.

Table 5

Well DEQ ID	Well designation	Well common name	Location
GW-001609	MW-1	Hatfield	Downgradient
GW-001608	MW-2	Busman	Crossgradient
GW-001610	MW-3	New Buhl Implement	Upgradient
GW-001611	MW-4	Country store	Upgradient
GW-001612	MW-5	Pence	Downgradient
GW-001613	MW-6	Miller	Downgradient
GW-001614	MW-7	McDonald	Downgradient

As discussed above in Section 2.0 Process Description on September 15, 2005 an additional 193 acres were permitted through a permit modification (Paulson and Gomez sites). Due to the addition of those sites, the staff recommends that Seneca reviews the groundwater monitoring network and prepares a study for DEQ's review and approval that will determine whether or not the current monitoring network is adequate.

Section 9.0 Groundwater Monitoring of the 2004 Annual Wastewater Land Application Site Performance Report discusses the groundwater wells concentrations obtained during year 2004:

- "Using the basic statistical comparison of mean upgradient and downgradient values for Nitrate-Nitrogen, it appears that downgradient levels of NO_3-N are higher in all cases and that the Site could be causing a change in groundwater NO_3-N levels." However, more data is needed to provide an acceptable level of confidence. Also, Nitrate-Nitrogen did not exceed the 10 mg/L standard in any of the wells that were sampled during the 2004 reporting year.

- The comparison of mean upgradient and downgradient Total Fe and Mn concentrations shows a side-wide mean downgradient increase of 0.345 ppm and 0.014 ppm, respectively for the 2004 reporting year data. Seneca started to monitor the dissolved Fe and Dissolved Mn to determine if turbidity (sediment) in the samples was contributing to the total Fe and Mn results. All of the dissolved Fe and Dissolved Mn samples were below the standards with the exception of the sample from MW-5 where dissolved Fe was reported at 0.52 mg/L during January 2004. Additional monitoring (i.e. Total Suspended Solids (TSS)) is necessary to determine if the higher total Fe and Mn are due to turbidity in the samples.

- It appears that during the 2004 reporting year the majority of the wells exceeded the secondary standard for TDS. Comparing the mean upgradient and downgradient values it appears that all

the downgradient concentrations are higher and the Site contributed TDS to groundwater during the 2004 reporting year. As discussed previously more data is needed.

- A similar comparison was done for both total phosphorus and dissolved phosphorus. It appears that the Site does not contribute significant P to groundwater. Also, it appears that turbidity has a small affect on the level of P in the groundwater monitoring wells.
- During 2004 three samples had very high COD when compared to the rest of the groundwater quality data and compared to the previous years when the COD concentrations were considerably lower (typically less than 20 mg/L or much lower). Due to the fact that these high levels of COD do not correspond well with the other groundwater data reported from these wells, a comparison of the mean values for COD was not made.

The Nitrate-Nitrogen, Fe, Mn and COD concentrations from the groundwater monitoring wells were also discussed in the "Response to Seneca Foods Inc. comments on the draft permit modification LA-000016-02, Appendix "D" attached to the permit modification dated September 15, 2005. The database used for the discussion was from January 2001 to August 2004.

Several of the city of Buhl's wells (#1, #3 and #6) are located within one half (1/2) mile of the land application site. The source water assessment completed by DEQ on May 8, 2001 shows that the delineations of the wells do not appear to pose a contaminant risk to the city water supply relative to the wellheads, since the wastewater land application fields and groundwater that would be impacted is located down gradient and/or side gradient from the city wells.

In the past anaerobic conditions have occurred and they were causing odor generation. This is currently corrected by tilling the soil to incorporate the organic load and increase oxygen availability.

Additional groundwater monitoring data is needed to determine whether or not the wastewater loading rates at the land application site did have an impact on the groundwater. The facility should prepare a Ground Water Investigation Report to determine such impact. In addition a Water Quality Improvement Plan should be prepared for areas where ground water quality standards have been exceeded.

4.7 Proposed loading rates

Based on the analysis of the historic loading rates, soil and groundwater data the following table presents the proposed loading rates for each management unit.

Table 6

Constituent	Loading rate limit
Wastewater - Total (ac-in/ac-yr)	Up to Irrigation Water Requirement (IWR)
Inorganic TDS (NVDS) total wastewater, lb/yr/ac	4000
COD, growing season (91 days) pea, lbs/ac-day	50
COD, growing season (123 days) corn, lbs/ac-day	200
Total Nitrogen , lb/acre-yr (from all sources)	150% of crop uptake

The Response to Seneca Foods Inc. comments on the draft permit modification LA-000016-02, Appendix "D" dated September 15, 2005 discusses the wastewater, COD and Total Nitrogen loading rate limits as set in the above table.

4.8 Surface Water and flood zones

The land application site is located within the irrigation canal network of Twin Falls Canal Company. The Snake River is located approximately four (4) miles north of the site.

There are no 25, 50 or 100-year flood plains within the vicinity of the land application site.

The fields are diked in order to prevent wastewater runoff into canals, where the potential exists.

It is recommended that runoff controls and best management practices (BMPs) should be established such that runoff of stormwater is only possible after storm events greater than the 25 years 24 hours storm event.

4.9 Site Management

The majority of farms used to be gravity irrigated. Buried pipe is used to convey the wastewater. Concrete ditches or gated pipes are used for land application. The wastewater flows across the field in corrugates and tailwater is collected and reapplied as practical. The newly permitted McDonald/Lemoyne and Miller (northern half) farms are irrigated with two pivots and solid sets respectively. During the summer of 2003, solid sets sprinkler lines were installed at Hatfield (36 acres), Love and HDS farms. Also, as discussed in Section 3.1 Improvements, during the summer of 2005 three (3) new pivots were installed at the land application site and two new farms (Paulson and Gomez) with existing pivots were permitted for wastewater irrigation.

The farms are planted in a barley, corn, and peas rotation. Additional crops are grown at the land application site. During the 2003 year following crops were also grown: peas, pinto beans, wheat, alfalfa, haylage, oats and triticale. The pea wastewater is low in constituents concentrations and is irrigated early in the growing season. The corn wastewater is high in organic loading rates and is applied starting in July of each year.

In the past couple of years several improvements were initiated in order to aid with the overall performance of the wastewater land application operations. See above Section 3.1 Improvements for the list.

4.10 Buffer Zones and wellhead protection

The current WLAP permit requires that "a minimum of 50 feet shall be provided between wastewater application areas and well sites". Also, a 300 feet buffer zone distance was required between the land application site and the residences. At the time of permit issuance in 1995, the wastewater land application was done with a furrow irrigation system. Starting with year 2002 solid sets and center pivots were installed and are currently used at the site.

Because the wastewater is not disinfected when land applied, and the plant is in a suburban/residential location the following buffer zones distances are recommended:

Table 7

Buffer Zone between land application area and:	Minimum Distance (feet)	
	Furrow	Sprinkler
Inhabited Dwellings	300	300
Public Access Areas	50	50
Surface Waters, Natural	50	50
Surface Waters, Man-Made	50	50
Private Domestic Water Wells	500	500
Municipal Water Wells	1000	1000
Irrigation and monitoring wells	25	25

Seneca prepared and submitted recently (May 5, 2006) a "Well Location Acceptability and Buffer Zone Assessment" in order "to determine if domestic water supply wells within 500 feet of the Site have the potential to be adversely affected by land application activities and to assess current buffer zone distances". The Department is in process of reviewing the document and comment.

4.11 Odor Nuisance Plan

The WLAP permit issued in 1995, required in Schedule C, Compliance Conditions and Schedules, item 2 that "the permittee shall submit, for review and approval by the Department a nuisance odor management plan" and "the plan shall explain management and operational strategies, including determination of allowable COD application rates". The Plan was submitted, reviewed and approved by DEQ (see letter dated February 29, 1996 from Martin Bauer to Doug Thorson). However, based on the recent review of the plan, it was determined that the "allowable COD application rates" were not included with the plan as required. A COD loading limit will be included at the issuance of the new permit.

The facility developed and implemented in 2003 an addendum to the odor nuisance plan. The plan includes maintaining an odor report log, monitoring meteorological conditions, and a standard operating procedure to respond to complaints if they occur.

The staff recommends that the Odor Nuisance Plan be updated to reflect the current operation and modifications in the management of the land application.

4.12 Solids Management

During the 2004 operating year the facility started to collect the corn baler water into a trailer/slurry spreader. The bailer water is injected 4 to 6 inches below the ground surface. It appears that the method is protective of environment and human health.

The staff recommends that a Sludge and Solids Management Plan be prepared for the Department's review and approval.

5.0 RECOMMENDATION

DEQ staff recommends that the land application draft renewal permit be issued. The draft renewal permit contains guideline-loading limits for nitrogen, chemical oxygen demand, GS hydraulic loading rates. The loadings should be protective of the groundwater. Also, monitoring and reporting requirements have been specified in order to evaluate system performance and to determine compliance with the permit conditions.

References

(1) Idaho Department of Environmental Quality, Idaho Watewater – Land Application Program Addendum – Phosphorous Guidance, December 2003
(2) Idaho Department of Environmental Quality, City of Buhl (PWS 5420007) Source Water Assessment Final Report - May 8, 2001
(4) CH2MHill – Operation Plan for Land Application System, prepared for Seneca Foods Inc., April 1996
(3) CH2MHill - Application Information for Seneca Foods Land Application Permit, January 31, 2000
(4) EHM Engineering, Inc. – Staff Evaluation, Seneca Land Application LA-00001601-03, January 19, 2001
(5) Cascade Earth Sciences – Addendum to the Permit Renewal Application for Seneca Foods, Buhl, Idaho, November 7, 2002
(6) Cascade Earth Sciences – Work Plan for Well Drilling Services, Seneca Foods, May 7, 2003
(7) Cascade Earth Sciences – Groundwater Monitoring Plan. Based on Geology and Aquifer Conditions, Seneca Foods, August 2003

Appendix 1

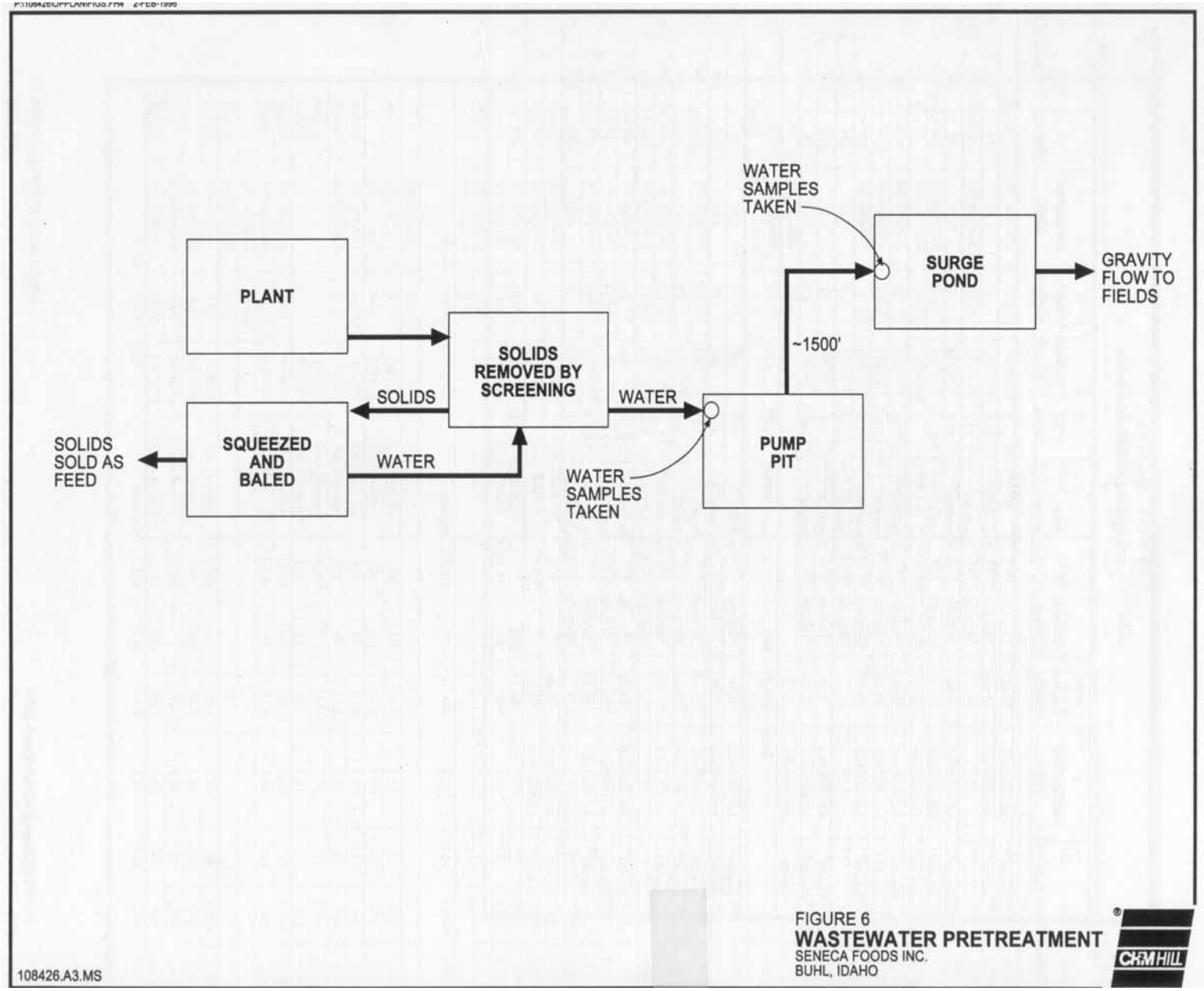
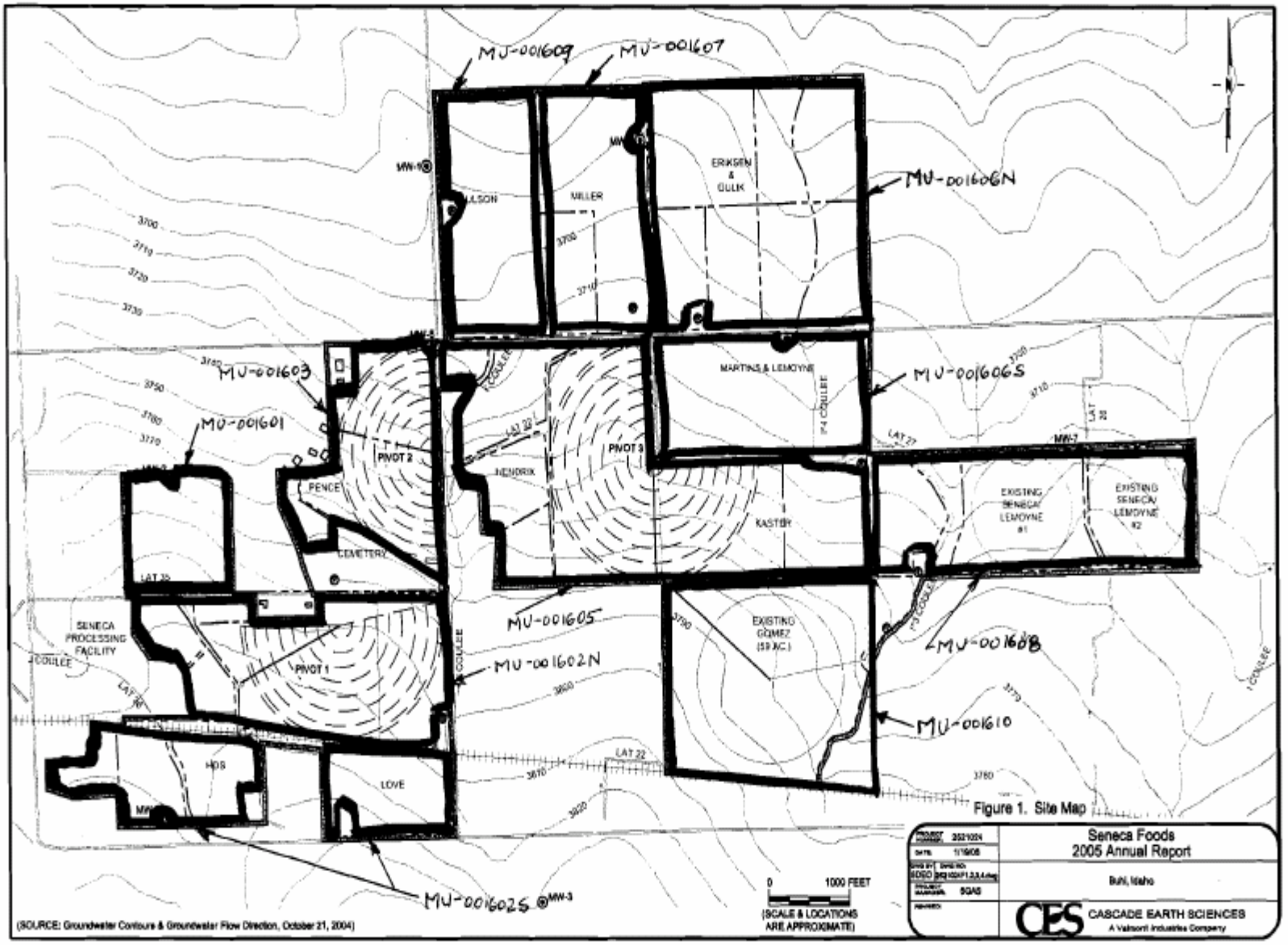
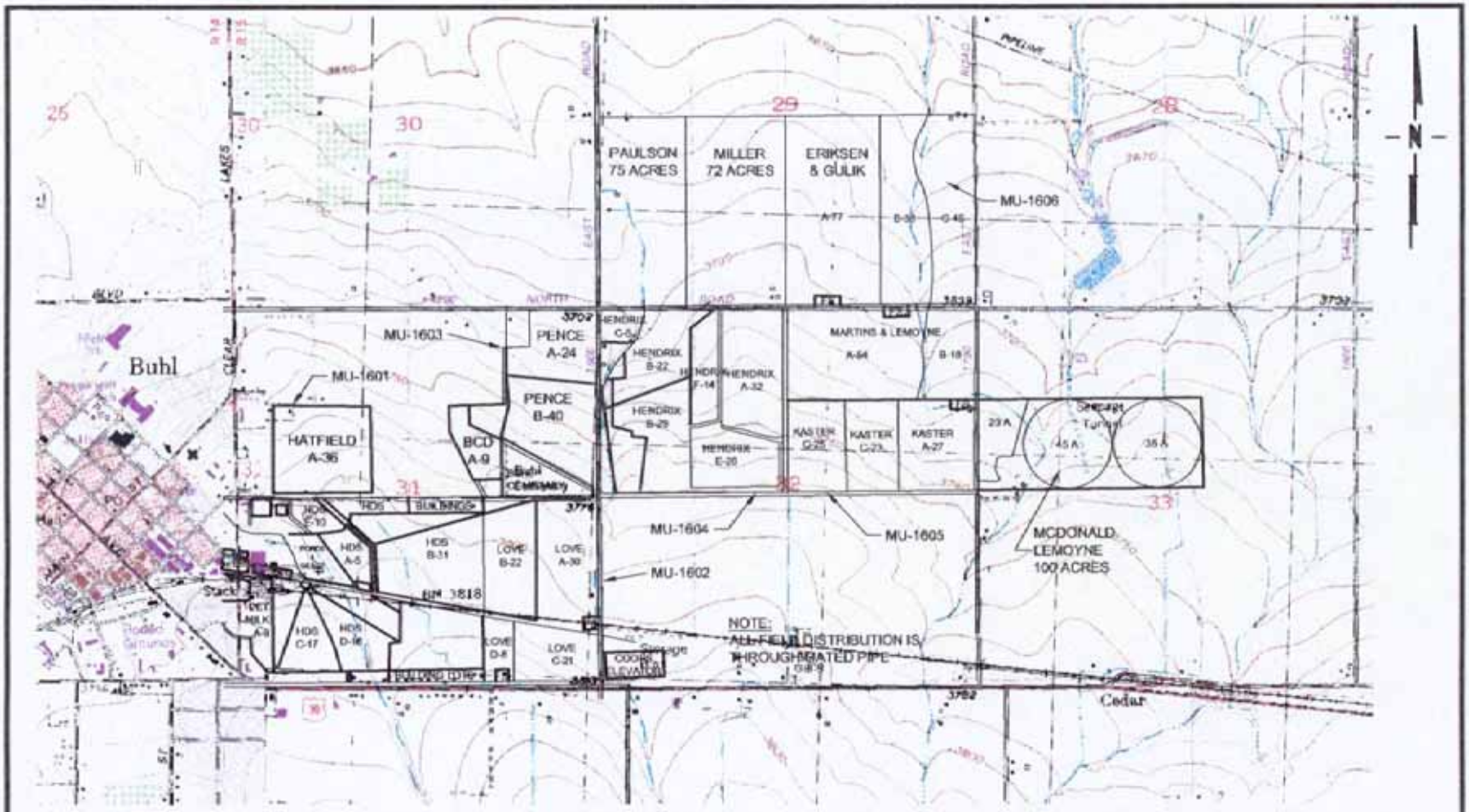


FIGURE 6
WASTEWATER PRETREATMENT
SENECA FOODS INC.
BUHL, IDAHO

CH2MHILL


MU-001609
MU-001607
MU-001606N
MU-001606S
MU-001603
MU-001601
MU-001605
MU-001602N
MU-001608
MU-001610
MU-001602S
MW-1
MW-2
MW-3
ERIKSEN & GULIK
MILLER
MARTINS & LEMOYNE
HENDRIX
KASTER
EXISTING SENECA LEMOYNE #1
EXISTING SENECA LEMOYNE #2
EXISTING GOMEZ (59 AC.)
PENCE
CEMETERY
SENECA PROCESSING FACILITY
HOS
LOVE
PIVOT 1
PIVOT 2
PIVOT 3
LAT 22
LAT 23
LAT 25
COULEE
0
1000 FEET
(SCALE & LOCATIONS ARE APPROXIMATE)
(SOURCE: Groundwater Contours & Groundwater Flow Direction, October 21, 2004)
Figure 1. Site Map
Seneca Foods
2005 Annual Report
Buhl, Idaho
CES
CASCADE EARTH SCIENCES
A Valisont Industries Company



NOT TO SCALE
(LOCATIONS ARE APPROXIMATE)

Fig. 2. Site Topography Map

EXPLANATION

CONCRETE DITCH

SURFACE PIPE

(SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC MAPS OF BUHL, IDAHO, 1992 AND CLOVER, IDAHO, 1992)

PROJECT NUMBER: 2321004	SENECA FOODS
DATE: 3/12/03	
DRAWN BY: DEO / DRWG NO: 2321004F2.dwg	BUHL, IDAHO
PROJECT MANAGER: GS	
REVISED	CES CASCADE EARTH SCIENCES A Valmont Industries Company